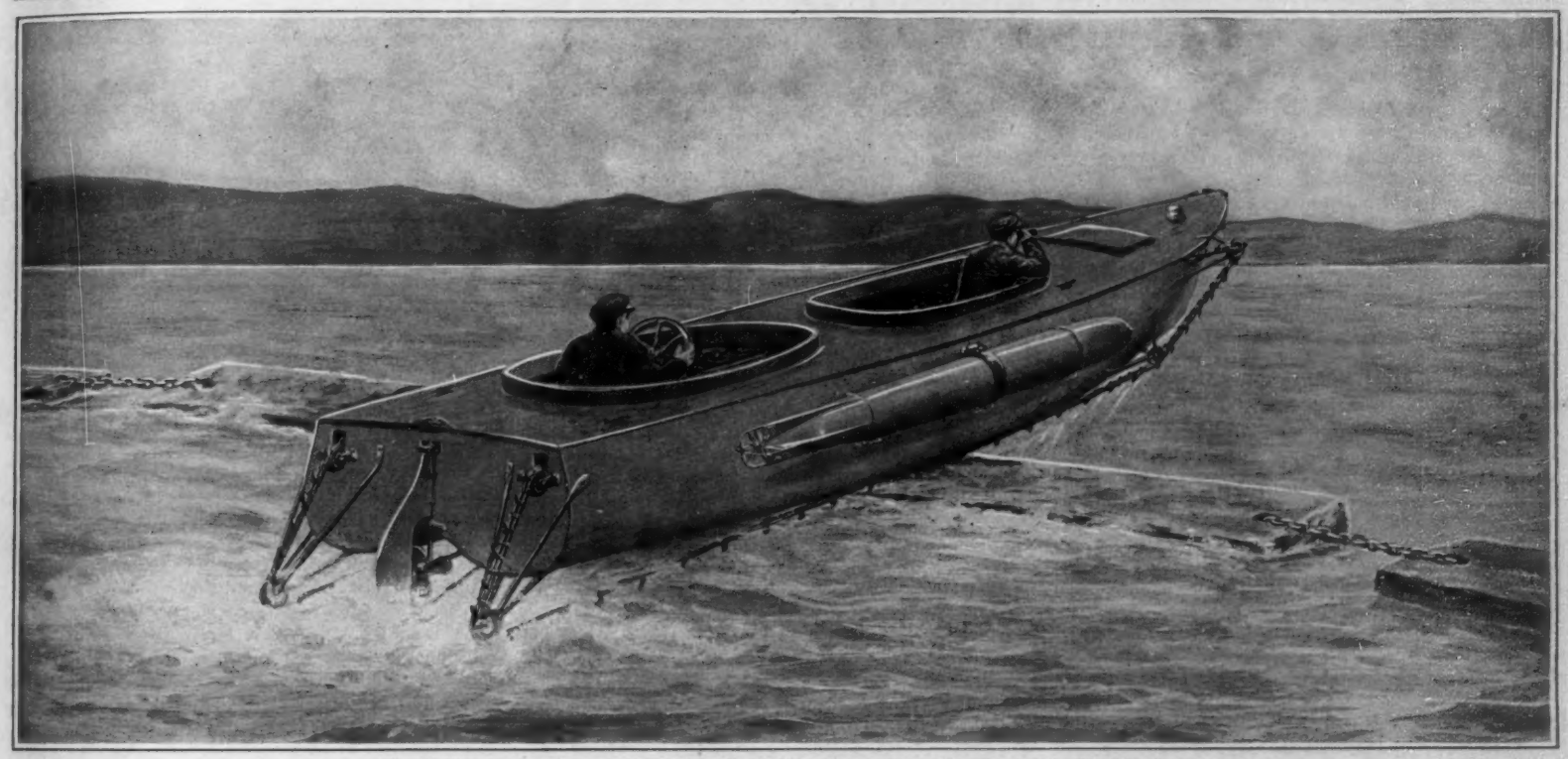
SEVENTY-FOURTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXIX. NUMBER 21] NEW YORK, NOVEMBER 23, 1918 [10 CENTS A COPY $5.00 A YEAR



The Italian sea tank mounting a torpedo-defense boom in an attack on a fortified harbor

Italian Sea Tank

THE operations of the Italian Navy will hold a conspicuous place in the annals of the Great War. The major units of their fleet (battleships, cruisers), have had little if any opportunity for battle; but this was not the fault of the Italian command; it was due to the unwillingness of the Austrians to come out of their fortified harbors and risk a fight in the open—a reluctance that was shared by their German Ally.

So what engagements took place were confined to the smaller craft, light cruisers, destroyers, motor boats and submarines, and in these branches of the service the Italians have shown admirable initiative, great skill, and unquestioned daring. Not only have they made constant use of the established types of craft, but they have developed new types that have scored some of the most brilliant successes of the war.

The attack of two torpedo motor boats upon three Austrian dreadnoughts of the "Viribus Unitis" type, while they were defended by a screen of destroyers, in which two of the dreadnoughts were sunk, was the most daring and successful feat of its kind in modern naval history.

Commander Luigi Rizzo was in command at the time. This feat is in the same class as the successful night attack on Pola, when another battleship was torpedoed. The Pola success was attained by the use of a boat which had been designed for this very kind of work. Its characteristics are shown in the accompanying drawing, from which it will be seen that the hull is of the "sea-sled" type, with a tractor device to enable it to climb over the torpedo defense boom, with which the harbor was closed.

On each side of the boat is an endless chain belt, provided with projecting prongs or teeth, which engages suitable sprocket wheels and the ends of the boat. These wheels are carried on brackets at bow and stern, the latter projecting far enough beyond the covering board to protect the rudder and propeller from contact with obstructions crossed by the boat. The tractor belt travels under the bilges of the boat and returns within the hull, as shown.

On meeting an obstruction the belt is started; and first the bow and then the body of the back is lifted across the boom. On each side, a 14-inch torpedo is mounted on two shelves or brackets and held in place by a hinged strap. When the strap is released the engine is started and the torpedo falls into the water; being steered to its mark by the gyroscopic steering gear.

The Need for Tin in the Manufacture of Silk

IN order to conserve the use of tin, many suggestions have been made as to what industries could get along without it or could use something else. Perhaps no other industry is so frequently mentioned in this connection as silk-making. Tetrachloride of tin is used in connection with tannin for weighting silk, and there is no commercial substitute. It is then obvious that if the silk mills were cut off from their supply of the metal, the manufacture of popular-priced silks would be interfered with, since sufficiently heavy silks can be produced at a reasonable figure only by using artificial weighting.

That there are two sides to almost any question is indicated by the remarks of a prominent silk executive on this subject. To the obvious claim that many operatives would be thrown out of employment we need pay no more attention than we wish; but we must listen to the rather ingenious plea that the curtailment of silk production would increase the demand for other textiles, such as wool and wool mixtures for dress goods—textiles of which there is an ever growing scarcity.

It is also said to be a mistaken idea that the American silk dyers are large users of tin. As compared to the nation's total consumption of the metal, the needs of the silk industry represent but a small percentage. Even of this percentage, less than one-half actually remains in the fiber, the greater part being recovered from the wash-water and converted again into metallic tin.

The American silk dyers require from 500 to 600 drums, of 900 to 1,000 pounds each, of tin tetrachloride per month. This is in liquid form, and tin constitutes but 45.4 per cent of the weight of the solution. The total amount of metallic tin used yearly may, therefore, be figured as about 1,500 gross tons; and making due allowance for what is washed off and resold, a liberal estimate for the net consumption would not exceed 900 to 1,000 tons per annum. The United States produces each year some 70,000 tons of tin, so that the silk man's requirements constitute little more than one per cent of the total.

The same authority from whose remarks we have extracted the above points out in addition, that the tin used in silk-dying is recovered from scrap tin, part of this being waste made in the manufacture of tin plate and part consisting of used tin cans. Of course if this were not used in the silk mill it would presumably be used somewhere else, since its use in the silk mill demonstrates that its economic recovery is possible; but it does seem, after all, that a man who uses a waste product is entitled to some consideration over one who insists on getting all his raw materials first-hand.

British Hollow Shafting and How it is Made

THERE are many advantages claimed for the use of hollow shafting instead of shafting made solid. By its use lubrication is rendered more simple, because it is possible to conduct the lubricating agent from within the shaft and through it by means of holes instead of merely allowing the lubricant to flow on the outside of a solid shaft. The principle is applicable to a drum mounted free upon the shaft, to the idler pulley, to the ball roll, and to similar installations. By supplying the lubricant under pressure to the hollow portion and delivering it through the holes to the bearings greater efficiency and safety are claimed.

There are several methods of producing hollow shafting. The British method is interesting and is explained as follows:

Assuming the finished article required to be a 1¼-inch shaft 22 feet long, with a ⅜-inch hole bored throughout its length, a billet 17 inches long by 4 inches square section is drilled through its length with a 1⅝-inch hole. A piece of steel is then electrically welded into one end, the bore filled solid with cement, and the top hole closed with a further piece of steel welded in, the billet being then sent to the mill to be rolled down to the required section. After rolling, the ends of the bar are cut off and the cement cleaned out on a special machine. Upon this machine the shaft is rigidly held, and a metal tube, delivering compressed air at a pressure of 1,200 pounds per square inch, is automatically fed down the hole, the time required to clean a shaft being about two minutes. As the cement is cut out in the form of a fine dust and delivered at the front end of the hole, it is caught up by a suction fan and delivered into a hopper below the shop floor, to be afterwards carted to the tip. This arrangement is thoroughly efficient, the shop being entirely free from dust.

Within very wide limits almost any size of shaft can be produced by this process. On a broad basis the amount of steel to be removed to form the hole is 10 per cent of the total weight of the shaft, and while it is not advisable to exceed it, this amount, especially in the case of large shafts, can be considerably reduced, if necessary. The process is being employed to manufacture bars from ½-inch in diameter with a 3-16-inch hole up to 6-inch in diameter and with holes of varying sizes. There are no limitations to the length other than those of rolling.

SCIENTIFIC AMERICAN

Founded 1845

Published by Munn & Co., Inc., 233 Broadway, New York, Saturday, November 23, 1918

Charles Allen Munn, President; Orson D. Munn, Treasurer
Allan C. Hoffman, Secretary; all at 233 Broadway

Entered at the Post Office of New York, N. Y., as Second Class Matter
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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

Civilization Vindicated

AMONG the fugitives who have fled to Holland during the past four years, the most pitiable spectacle of all was surely that presented by William Hohenzollern, when he was held up at the barbed wire of the frontier in the gray dawn of Sunday, November 10th. The unfortunate Belgian, French or British soldier, once safely past the barrier, knew that he would be ministered to by the compassionate hands of the Hollander, that he would find in that neutral land a kindly welcome, food for his hunger, tender nursing for his sickness and wounds, the prospect of return to family, friends and native land. But for this outcast, fleeing from the vengeance of the country which he had so outrageously betrayed, no hands were stretched forth in welcome. Full well he knew, and knows today, that he finds sanctuary in Holland only through the technicalities of that international law whose every obligation he has so foully broken. Vain and ambitious to the point of insanity, it has been his dream to win the highest possible pinnacle of fame. He has surely reached his goal; for to the very end of time, none will be found that can contest with him the distinction of being the world's greatest and most abhorred criminal.

"The mills of the Gods grind slowly, but they grind exceeding small": and if to some of us—to all of us—the working out of the great purposes that lay behind this long-drawn-out tragedy has seemed at times to be interminable, we realize, now that the stupendous result has been accomplished, that the mills of the Gods were indeed grinding small. Out of the clamor, the blood and the tears of this turmoil, there has emerged stronger, more spiritual, in every way more beautiful, that civilization for the saving of which this greatest of all wars has been fought. Out of the mills of the Gods has come the golden grain of humanity. That flight of gray-coated aristocrats to Holland, Switzerland, Scandinavia, is but the chaff which the wind driveth away.

Now that the fury of war has passed and the silence of peace is upon us, we shall realise more than ever before that this war has been fought for the saving of moral principles and not, as many would have had us believe, for material profit, economic gain, and the satisfaction of dynastic ambitions. Herein it is that this greatest of all wars has also been the noblest of all wars. The great majority of Americans took in its moral and spiritual significance from the very first; and history will pay honor to those men in high places who recognized this truth and called for our instant engagement to repel the monstrous attack.

Although the nations in Europe that were so ruthlessly assailed grasped very quickly the true significance of this assault upon international morality, it so happened that many of the intellectuals among us, as is so clearly shown in another column, in print and in speech told us that this war was in the class of all other wars—that it was a quarrel born of mutual greed, ambition and lust for world power. But it was inevitable that the vile thing which was being attempted should reveal itself in its true light to the clear thinking of the American people. It was as certain as the sequence of day and night that they would break through the clouds of obfuscation raised by the intellectuals, the pacifists, the politicians, and the deliberate pro-Huns, to demand that we take our place in the Great Crusade.

If we came a little late, we came with profound conviction; and apart from the great military force that we flung into the fight in the critical hour, we performed the even greater service of setting our seal of approval upon the cause of civilization, and of stimulating the faith and the courage of the Allies at the very darkest hour, when the enemy was launching his greatest effort.

It has been a costly sacrifice; but to have saved from utter destruction all the high and noble things upon which our life is founded, by which it is inspired, was well worth the cost—aye, even to the millions that lie under the sod and the tens of millions that carry, upon their bodies or in their hearts, wounds that will be long in the healing.

A Broken Idol

WE spoke last week of the materialist who has dominated the halls of history for a generation past. We showed that he had faith only in material, economic motives as the ruling factors in human acts and decisions. As a necessary consequence of his mental bias, when this man encounters a big idea which has universally and from time immemorial served as a prime mover of men, there is just one course open to him. He cannot attack, in general, the sincerity of those who have been swayed by that idea, he must attack their judgment; and this involves attack upon the particular idea in question.

Now the one outstanding idea of the human race, the idea that before all others has ruled decisions and impelled great deeds, is the idea of patriotism. No man will endure so much or undertake so much for the sake of any other abstraction as he will for love of his native land. So the materialist is obliged to bring his guns to bear upon the idea of patriotism. He must denominate it as an archaic and childish notion, excusable when man was more simple-minded, but, in a sophisticated *homo sapiens* of the twentieth century, as out of place as belief in fairies and wood sprites.

Ridicule is a potent weapon; but so firmly entrenched is the idea of patriotism that even with such aid it cannot be demolished. So its detractor finds a new name for it, a name by which he can call it without so greatly outraging our ears. Having thus rechristened it "nationalism," he proceeds to discredit it by offering a substitute for it; this, of course, is "internationalism." We are all to be citizens of the world, members of the human race, instead of identifying ourselves with fractions thereof. We are to cease being Americans and Britons and Frenchmen, and become human beings.

Many an internationalist will cry out against being put down as a materialist. But if he will reflect, he will see that the advantages of internationalism are all in the direction of economy in men and material and human effort. He may push his cause from the most ideal motives, so far as he personally is concerned; but in the larger aspect he is a materialist. He has but carried his combined evolutionary and materialist doctrines to the bitter, logical end; submerging himself as an individual, identifying himself with the species, he has advocated the course that held greatest promise of material benefit to the race.

Of all the material advantages of internationalism, the greatest is the elimination of armed conflict. With the going of nationalities, war vanishes automatically. So the internationalist is a tremendous pacifist; the idea of war becomes doubly repugnant to him by virtue of the very fact that it is a phenomenon of nationalities. But he is not blind; it has been as plain to him, these forty years, as to anyone else, that Europe was steering toward war. Only he has seen his own creed coming, as he thought, nearer and nearer realization, and he has ever cherished the hope that the world-state would arrive before the world-war.

The internationalist worked hard to bring into discredit the approaching war, and thus to postpone it. He had to steer a circumspect course; he had to show that the threat of war lay in the fact of nationalities, yet he must not make it in any way appear that the threat had to do with the patriotic idea; for as a materialist he cannot concede such power to an idea. So he simply argued that as long as the world was divided into fractions, each fraction would seek to dominate the others—that this was Nature's law.

This argument, it would seem, would place at least some nations on the defensive, and imply that these were entitled to sympathy; but the internationalist would not admit even so much of virtue in a nation. All nations were, in the very nature of things, on the offensive; any which appeared to be in an attitude of defense were simply those which had least prevailed. No nation could be content with what it had; the entire outfit constituted a disreputable collection of highbinders, without a decent impulse among them.

On this ground the historians of the past generation have explained the European armaments, the train of events in the Balkans, Africa, China. We were drilled by these teachers and writers that, when the outbreak came, whatever nation might for the moment have succeeded in putting itself in the position of having been wronged, we must pay no heed. There could be no choice between these evil-doers; we must frown on all alike.

Suppose we now abandon these assumptions, and in their place postulate a single group of nations intent on forcing a war of conquest upon the others, who were arming solely to meet this threat. Let us suppose that outside the circle of nations directly concerned, there exists one nation, in resources the mightiest of all, in temperament notoriously idealistic—a nation which not so long ago went through four years of bloody civil war to decide between two conflicting principles. If the facts of the plot against the world appear, this nation of ideals will certainly interfere with all its might. But if the doctrine of internationalism has succeeded in throwing all the belligerents promiscuously into one category, there will be no wrong-doers and no wronged, but merely a band of cut-throats engaged in a private altercation.

The real culprits can well afford to submit to such classification, when it includes also their victims and thus cuts these off from the aid that alone will save them. We do not know to what degree these pernicious doctrines were deliberately promulgated by Germany, with the intent that they should lead to this result. We do know that German professorial thought of the same type as that which, in 1914, flew to the rescue of the war and the atrocities, was very active in forwarding the philosophy which we have outlined. We know that, particularly in academic circles, this philosophy with all that it entails had become thoroughly dominant before the war broke out.

As instance of the extent to which this was so, we need only cite the case of our Chief Magistrate. After two years' first-hand observation of Germany's war, with all the documentary evidence of its beginnings in hand, Mr. Wilson was still so firmly in the grip of his early academic environment that he could refer to the war as a piece of collective madness on the part of all concerned, from which Americans, individually and collectively, must hold themselves aloof in conscious superiority and conscious condemnation. Before this evidence of the universal vogue and insidious persistence of the doctrines of internationalism, may we not pause and express gratification that the American nation was able to recover its mental poise in time to be of avail in terminating the conflict?

Business Precision

IF there is any one thing that the present war has taught our producers and merchants it is the basic necessity of scientific precision, says Burwell S. Cutler, Chief, Bureau of Foreign and Domestic Commerce. Time and again military failure has been threatened by inability to utilize to the "nth" degree the scanty materials available for production of munitions. This is no less true in the manufacture and distribution of uniforms than of guns and shells.

The elimination of waste, whether it be in men or time or material, has been forced upon all belligerent peoples as a measure of national defense. It was obviously impossible for any one of the belligerent nations to increase its production proportionately to the needs of its armies and civilian population and at the same time withdraw from factory and shop millions of men—unless the utmost skill in the use of the remaining facilities was employed. Factory after factory had to reduce the waste formerly resulting from rejection of faulty workmanship; even the original amounts of material allowed for standard units of production were reduced to the point where greater output and less material ran concurrently. For instance, a far greater volume of steel products is now being made with far less steel than four years ago. Less wool is found in clothing; less first-grade sole leather in shoes, etc. Yet this change has come about in many cases without deterioration in quality measured by the usefulness of the article. It is quite conceivable that a six-inch shell can be given as high a destructive force with a sixteenth-inch casing as an eighth-inch casing, and that is true of the other commodities mentioned, the test being always the exact purpose to be served.

Under the supervision of the best scientific managers to be found in industrial and mercantile life every process of production and distribution has been carefully measured until a nearly ideal attainment is established as a standard for all to follow. The need was desperate and the regeneration has been thorough.

It may be said that the ground of procedure has been exact data ascertained by thorough study and experimentation. Putting it another way, no goods are manufactured for which there is not a specific need thoroughly apparent and demandatory; neither is there delivery of articles to any region or people where want of them is not acute. This surety of procedure requires, of course, a prior study of the facts, and these facts are the data to which Mr. Cutler refers. The inquiry has extended into many phases of human activity.

This habit of basing all operations on sound and accurate information may be expected to survive, after the war, in the factories and storehouses of Europe. We in the United States must adopt the same attitude of scientific precision and should, as business men, avoid the excess cost of business conducted on inspiration as compared with business based on industrial and trade data. The Department of Commerce and other institutions of Federal, State, and private authority can supply our business interests with facts of the case relative to almost any economic problem or uncertainty, if the business men will but acquire the habit of applying to those agencies for advice and information.

Engineering

Mast Turning Lathe.—Heretofore masts have had to be shaped by hand, a task which is very laborious and requires skilled workmen. Recently, however, a machine has been designed which will shape masts up to a hundred feet in length and three feet in diameter. The timber is set up in the machine and revolved at a speed of 50 revolutions per minute, and it is shaped by a cutter head which is electrically driven at the rate of 700 revolutions per minute. This cutter head is mounted on a carriage which is moved along the timber against a rail set to give the proper profile to the mast.

Retaining Walls of Concrete Cribwork.—There are certain advantages in the use of cribwork for retaining walls of roads on hillsides, but it is not advisable to use timber because of the short life of this material. This has led the Oregon State Highway Commission to use concrete lumber for the purpose. The concrete units are made in 8 by 6-inch section and of a length not less than half the height of the crib. These units are notched so that they can be interlocked. The cribwork can then very easily be built up, after which it is filled with rock, following the same course as in the ordinary timber construction.

Pollution of Boundary Waters Between Canada and the United States.—The international joint commission on boundary waters between the United States and Canada which has been studying the conditions of the Great Lakes and the rivers separating the two countries has just issued a report recommending that all sewage emptying into these waters be treated. It was found that the lakes themselves, except for the shore waters and the mouths of rivers, were in a state of almost absolute purity, but that in the rivers, particularly those of Detroit and Niagara, conditions were very bad, and a menace to the health of the people living along shore. As this condition is in direct contravention of the treaty between the United States and Great Britain, it was recommended that all city sewage be treated for the removal of bacteria and matters in suspension; that vessel-sewage be disinfected before it is discharged; and that the discharge of garbage and saw-mill waste be prohibited.

Emergency Bridge Building to Save a War Crop.—A writer in a recent issue of the *Engineering News Record* describes an interesting piece of work, which was done on the Big Horn River a year ago, when a 250-foot aqueduct was swept away by a flood. The aqueduct crossed the river in a steel flume on steel trusses of 80-foot span carried on concrete-filled twin tube piers. On June 29th, 1917, one of these piers was undermined and 239 feet of the aqueduct was washed away. It was highly important to restore the aqueduct immediately to save large crops which were dependent upon the water it carried. In order to save time, it was decided to carry the aqueduct on a suspension bridge, and despite delays due to the scarcity of cables which had been requisitioned by the Government for submarine nets, the work was completed on the 20th of July. But no sooner was the water turned on, than one of the cables connecting the main cables with the "dead man" on the west side of the river, failed, causing the pier on this side to topple into the river The flume was badly twisted and bent out of shape. Immediately work was resumed, and to save time a 48-inch wood stave pipe was used to replace the twisted iron pipe. On August 5th the reconstructed suspension bridge was finally completed and the water was turned on.

Petroleum Substitutes for Miners' Lamps.—The question of a substitute for petroleum in miners' safety camps has been studied in Spain with interesting results. The president of the Spanish Black Damp Commission recently made a report on this subject to the head of the Agricultural Department. It contained the following: A mixture of 77.5 per cent of 96 degree alcohol, and 22.5 per cent of benzol, according to him, finds favor with some miners, but has been rejected by others after trial. If the proportion of benzol is increased the lamp is apt to smoke. The illuminating power of a lamp burning this mixture is 77 per cent of that of the standard petroleum lamp, both without the gauze. Another mixture, consisting of 62.5 per cent by volume of 96 degree alcohol, 22.5 per cent of benzol, and 15 per cent of petroleum gives an illuminating power of 98 per cent of the aforementioned standard lamp under the same conditions. In order to improve the illuminating power of the binary mixture first named, turpentine and fusel oil have been added in the following proportions: 62 per cent by volume of 96 degree alcohol, 16 per cent of benzol, 7.5 per cent of rectified turpentine, and 14.5 per cent of fusel oil, but this substitute is apt to clog somewhat the wicks, and when burning gives off a disagreeable smell; its illuminating power, however, is very good, being 1.42 times that of the standard lamp. The rectified turpentine is the distillate passing over before the temperature of 155 degrees C. is reached, and its density is 0.859.

Science

A British School of Archæology is to be founded at Jerusalem under the auspices of the British Academy, which is now soliciting funds for this purpose. The school is to be both a research body, to carry on excavations, and a training school for archæologists.

Magnetic Data for Mine Surveyors.—The British Meteorological Office, in consultation with representatives of the Institution of Mining Engineers, has recently arranged to supply week by week, for publication in the British mining journals, a schedule of values for every two hours of the magnetic declination at Kew Observatory. This arrangement is made for the benefit of surveyors in mines, whose work is dependent upon an accurate knowledge of the variations of the magnetic needle. While data from Kew are used provisionally, there are several other British observatories, some of them nearer to mining districts, from which similar data are obtainable, and if the present publication proves to be useful its scope will probably be enlarged accordingly.

Rural Hygiene in Spain.—By means of a special service devoted to rural hygiene inspection (Inspeccion de Sanidad del Campo), the Spanish Government is now waging a determined warfare against malaria, and, in spite of the increased cost of quinine and other difficulties due to the war, the prevalence of this disease has already notably diminished. The agricultural experiment stations have undertaken the cultivation of medicinal herbs and the re-forestation of marsh lands, in order to reclaim, at least in part, the 741,330 acres which constitute the chief centers of malaria in the kingdom at the present time. In the year 1913 the number of cases was 233,404; the number of days of labor lost on account of the disease was 3,515,595; and the money loss to the nation was estimated at upwards of $26,000,000.

The Smallpox Problem on the Mexican Border.—An epidemic of smallpox, with a high percentage of mortality, raged at Eagle Pass, Texas, during the winter of 1917-18. Eagle Pass is just across the Rio Grande from the Mexican town of Piedras Negras, where a similar epidemic prevailed at the same time. In a report on these outbreaks, the U. S. Public Health Service points out that smallpox is practically endemic at both the towns in question and is reported nearly every month in the year. The causes of this situation are to be sought in the unhygienic living conditions of the Mexican population on both sides of the border, promiscuous visiting of houses of patients and those who have died of the disease, concealment of cases, and, in general, the attitude of the Mexicans toward the disease. It is so common among them that they regard it lightly and are prone to treat it with old herb remedies and patent medicines rather than call in a physician. They are also averse to being vaccinated. The Public Health Service has maintained a force at Eagle Pass for more than two years to vaccinate travelers coming from Mexico. Recently instructions have been issued that all passengers from Mexico who have never been immunized against smallpox shall be not only vaccinated but returned to Mexico until the vaccination "takes."

The Names of Himalayan Peaks.—A recent article by Mr Arthur R Hinks, secretary of the Royal Geographical Society, published in the *Geographical Journal* opens up what is likely to be an interesting and prolonged discussion among geographers concerning the nomenclature of the peaks of the Himalaya and adjacent regions of India. At present the names of these mountains seem to be almost hopelessly confused. For example, the Survey of India recognizes only one personal name—viz., Mt. Everest—out of the many that have from time to time appeared on maps. The peak frequently known as Godwin-Austen was officially named K^2, in accordance with the plan introduced by Colonel Montgomerie of calling the whole Karakorum region K, and its peaks K^1, K^3, K^4, etc., somewhat on the anology of naming stars by constellation and letter or number. Unfortunately the Indian Survey has successively adopted various other nomenclatorial systems, and the latest designation of this particular peak is Pk 13/52 A. This means that it is peak No. 13 on Sheet 52 A of the official chart of southern Asia. The sheets of this chart are one degree square; *i. e.*, 69 miles by 60 miles. The latest series of charts, as published, omits topographic detail, showing only the numbers and the rays of triangulation, and is therefore an inconvenient means of identifying the peaks. Moreover, in very many cases the numbers indicate triangulation points which are not peaks at all. Mr. Hinks publishes a long statement from the surveyor-general of India, Sir Sidney Burrard, setting forth the reasons for rejecting the many fanciful names, personal and otherwise, assigned to mountains by explorers and others, but we believe that, for practical as well as sentimental reasons, a great many of these names will be perpetuated outside of official literature; especially as very few Himalayan mountains have ever borne native names.

Aeronautics

The Greatest Air Raid.—On October 9th last, an American bombing expedition of 350 airplanes dropped 32 tons of explosives on German cantonments in the area between Waerille and Damvillers, about twelve miles north of Verdun. In this expedition were more than 200 bombing machines, 100 pursuit machines, and 50 triplanes. The bombing planes had splendid protection during the aerial battle which took place in the course of the raid. Twelve enemy machines were destroyed. Only one Allied machine failed to return.

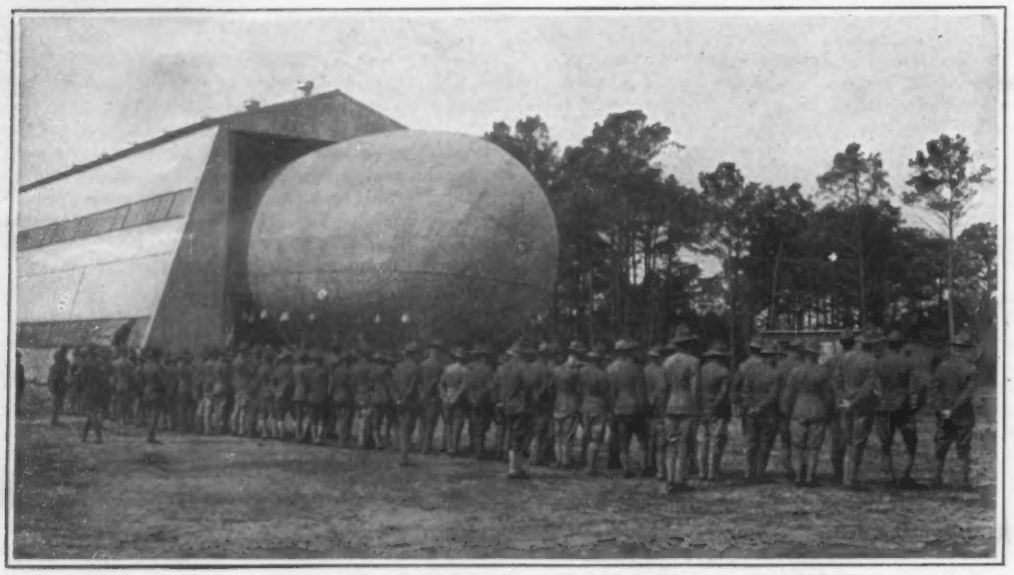
Flying Hospitals of France.—According to Mr. F. G. Falla, writing in the *Daily Mail*, a squadron of surgical airplanes is in course of formation in France. Each machine, in addition to the pilot, will carry an army surgeon and X-ray operator, and a complete set of surgical apparatus, including a folding aluminum table. Electric current for X-rays and for sterilizing and so forth will be supplied by a dynamo. The intention is not to perform operations during flight, of course, but to carry succor to badly wounded on any part of the battlefield.

Parachutes of German Airmen.—Not long since a German airman landed behind the American line in France, after escaping from his airplane by means of a parachute. Thus certain information concerning the German airplane parachutes is now available for the first time. It appears that the enemy airmen make use of special silk parachutes of a more delicate and accurate construction than those employed by balloon observers. The aviator sits on the folded parachute as on a cushion until he wishes to use it. Then he guides his plane upwards until it stalls, and jumps clear of the fuselage. It is reported that the German parachute arrangement leaves little to be desired.

American Aircraft Production.—It is reported that the production of American aircraft has now reached a state where it is virtually limited only by the facilities for transporting the airplanes to France. The production of Liberty motors during October reached 1,000 a week—a total which had not been expected before December. Latest compilations show that since June 1st about 2,500 fighting airplanes of all kinds have been shipped to the American forces in France. None of the belligerents at any time since the beginning of the war has had more than 3,500 airplanes in service. The 2,500 airplanes shipped included nearly 150 of the heavy bomber type.

Armored German Biplane.—On May 16th last the British fliers brought down a German A. E. G. biplane, designed for carrying out offensive patrols against infantry and furnished with armor for the protection of its crew. The armor, consisting of plate 5.1 mm. thick, is applied to the sides and bottom of the fuselage from the nose to a point rear of the gunner's seat. Further, an armor bulkhead is placed in rear of the gunner to protect him from behind. There are three panels of armor on each side, and three on the bottom. The total area of the armor is 105.8 sq. ft., and the total weight 860 pounds. It appears to have been added by way of experiment, and is not employed as it might have been in a structural capacity; that is to say, it is simply an attachment and does not add materially to the strength of the fuselage. It is fixed to the framework by set screws entering clips clamped round the fuselage members. Tests of the armor show that it is undoubtedly too light to afford protection against British armor-piercing bullets fired from the ground when the machine is at a lower level than 500 feet, and that to be safe from all but a very small percentage of hits the machine would have to fly at more than 1,000 feet.

Air Service Openings.—It is announced by the War Department that the Air Service is again open for recruits in all its branches, as a result of the recently expanded air program. In order to insure the success of the present plans, it is necessary to build up immediately a reservoir to supply the constant stream of men as occasion demands. Under the ruling of the War Department, civilians, irrespective of draft status, may be inducted as candidates for commissions as pilots, bombers, observers and balloonists, and in the enlisted personnel, as mechanics. The waiting list of 6,600 prospective fliers has been used up and at present there is a growing demand for students in the ground schools. This in a sense obviates the long delays in being sent to a ground school which have been the source of discouragement in the past to men desiring to fly. The examining board in the vicinity of New York is located at 104 Broad Street. Applicants in other cities may apply at George School of Technology, Atlanta, Ga.; 739 Boylston Street, Boston, Mass.; 230 East Ohio Street, Chicago, Ill.; Camp Dick, Dallas, Texas; Post Field, Fort Sill, Okla.; Marsh-Strong Building, Los Angeles, Cal.; University of Minnesota, Minneapolis, Minn.; Ft. Sam Houston, San Antonio, Texas; 55 New Montgomery Street, San Francisco, Cal.; 525 South Euclid Avenue, St. Louis, Mo.; Building "D," Floor 1, Wing 2, Washington, D. C.; and Camp Sherman, Canal Zone.



A sausage balloon company and its "baby"

The sausage going into action

Our Aerial Sausages

The Contribution of the Captive Balloon to Strafing the Hun

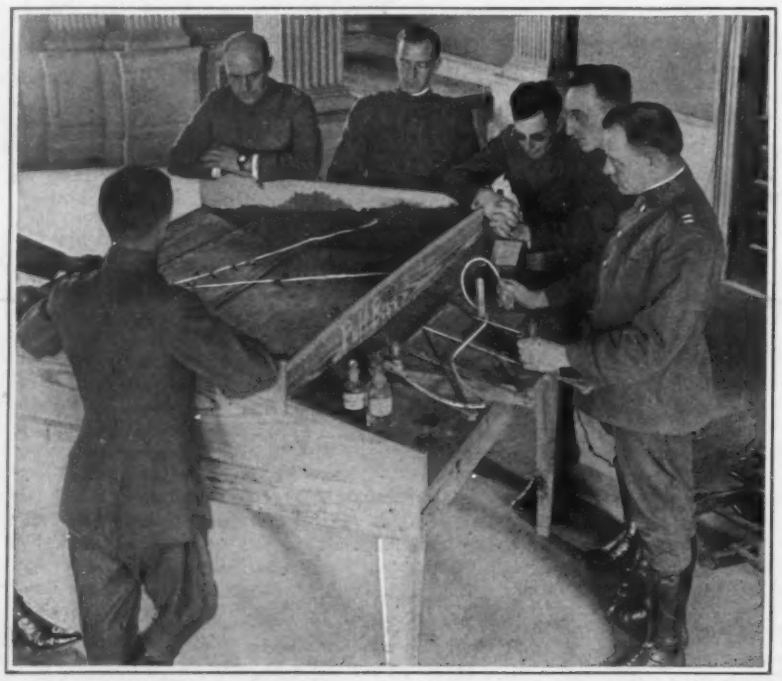
By C. H. Claudy

ALMOST anywhere along the western front one could see them—if not ours, then French or British. They floated lazily at various altitudes, their cables, netting and basket supports invisible, gray or gold against the sky. If floating low, and seen from the direction to which the wind is blowing, they presented a quite absurd likeness to a huge elephant, the vanes, two horizontal and one vertical, looking for all the world like huge ears and a curled-up trunk.

They are distinctly a development of this war. The captive balloon was used in many previous wars, but always as a spherical bag. And the spherical balloon, captive, is about the most unmanageable air brute conceivable. On a clear calm day it is as serviceable as the best of the "kahkos" (the "doughboy" translation of Captain Caquout's name), but in a wind, a spherical balloon is a merciless tosser about of instrument and observer, and is not capable of much altitude anyway, because of the immense surface which it offers to the moving air.

The "kahko" is long and slender and possesses the three vanes which hold it steadily in the air, even in high winds. These vanes are filled by the wind—they are but long curled pockets in the fabric and the harder blows the wind, the tighter do they fill and the stiffer do they hold. When the balloon is hauled down for storage over night, in balloon house or field shelter, the vanes droop and die, and are thus not at all in the way.

Never before has gunnery achieved the accuracy which this war has demanded of its artillery. Never before have the demands from artillery for observation been so exacting. Always there has been a correction in the range and deviation formula by which heavy guns are pointed, this correction dealing with the wind. But never before has it been so important to know just what correction to apply. This war has demanded accurate knowledge of wind direction and velocity not only at the surface but at various heights above the surface, for never before, certainly not for America, has big gun ammunition been hauled so far before firing, thus becoming exceptionally valuable.



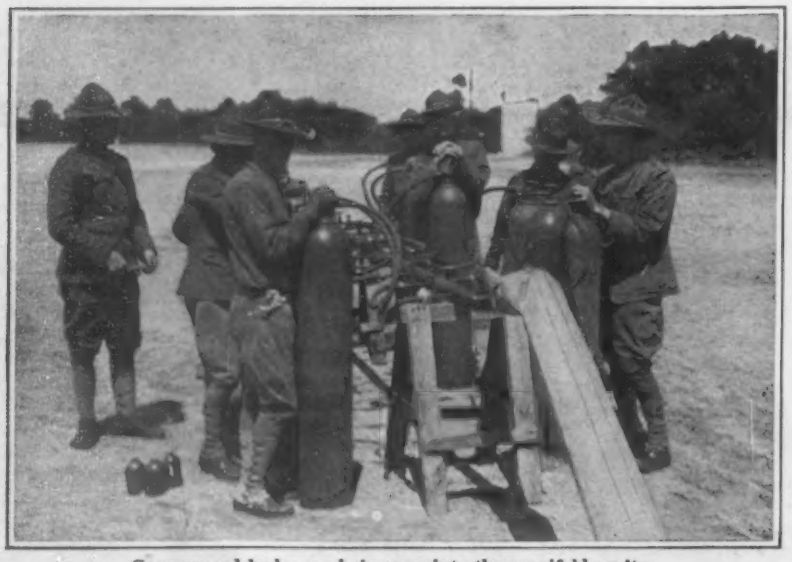
Learning to judge the angles of smoke puffs on a miniature landscape

So the captive balloon has had as one of its principle duties the carrying of an observer and observing instruments into the upper air, by means of which the wind direction and the velocity can be accurately obtained.

Wind velocity is obtained of course from the familiar anemometer. Wind direction is obtained by the use of a compass and an observation of the balloon itself, which always points squarely into the wind, its vanes at the point of the compass to which the wind is blowing. And while it is true that the captive balloon cannot by any means reach such heights as a shell, it is equally true that observations of wind at various altitudes will frequently tell the whole story of wind velocities at altitudes far above those which can be reached with the instruments.

The duty of the observer in the captive balloon only begins, however, with his meteorological observations. He is able to do photographic work of peculiar value in making maps, since he can make two or more pictures at altitudes that are known with extreme accuracy. His position above the terrain is also known with extreme accuracy and even the non-mathematician can see that having two photographs at different altitudes in a vertical line, a known distance apart and absolutely located above the terrain, it is a mere matter of calculation to construct a map accurately to scale.

The captive balloonist has also much to do with observation of artillery fire. He is in a much better position to watch than the airplane observer, because he is unhampered by continual motion. True, he cannot get over or near the target, as can the mobile plane, but on the other hand, he can use glasses with the same ease he might upon *terra firma*, and complete observations at his leisure which the plane observer must make in a moment. At the extreme ranges of twenty miles or more, balloon observation is of little use. But it is said that for big gun fire at ranges as high as fifteen thousand meters on a good day balloon



Compressed hydrogen being run into the manifold on its way to the bag

Ready with sand bags and cords to choke off the hydrogen supply pipe in case of fire

observation will reach an accuracy not less than ten meters. That means that at something less than fifteen miles an aerial observer can judge within thirty feet where a shot struck. Such observations are more likely to be accurate for deviation than for range, of course, but are vital for all that.

Another advantage which the balloonist has over the airplane is that of constant telephonic communication. Of course, the wireless telephone has been developed surprisingly, and is in use in airplanes. But at its best it is a limited power, and requires a muffling of the observer in a headpiece to keep out motor sound, which by no means adds to the ease of making observation. The balloon observer is in constant wire telephone communication with those below. His telephone wire is wound up or reeled out on a separate reel as his cable is lengthened or shortened, and he can both send and receive his messages with the same ease as does a business man at his desk.

The mechanics of flying a captive balloon includes the filling of the bag, the management of winch, and the storage and care of the bag when resting on the earth. Simple as these things appear, they have been the source of a great deal of study and have resulted in the development of a balloon technique which produces the maximum of results in the minimum of time. A balloon company will include some two hundred men, and at least three officers, more of the latter often being necessary where continuous observation is required or where the hazards of the service are such as to make constant relief from the strain of aerial duty a necessity.

In any captive balloon work at least two and often three are always on duty—one or two aloft, charged with making observations, and one on the ground managing the "sausage," charged entirely and only with the safety of the man or men aloft. For the observer in the air is wholly at the mercy of circumstance and the enemy. He has no means of defense against any attack, and can neither rise nor come down save at the will of those who manage his winch. The officer in charge on the ground, therefore, must have a capacity for continuous observation which will not fail at critical moments, and must also have a nice discriminatory power as to the relation between danger, wind velocity and strength of outfit. For these three factors are very delicately interwoven.

It requires a certain time interval to get a captive balloon down. Its rate of ascent is usually controlled only by the capacity of the bag to rise—that is, its margin of lift over its weight and what wind pressure there may be. Its rate of descent is regulated by the speed at which the gasoline power-winch hauls in the slender steel cable. But the choice of that rate is where the necessity for keen judgment comes in.

In a high wind, for instance, the rate of hauling in must be much slower than in a calm, otherwise a strain may be put upon the cable or the fabric of the balloon which is beyond the limit of safety. On the other hand, a German plane coming up (coming down!) to attack a "khako" has never been known to wait on the safe speed of hauling down. And if an unexpected and unseen attack develops, the balloon may have to come down at a speed beyond its factor of safety. It is the officer in charge below who must judge whether or not the chances of the balloon bursting or breaking away, due to too great a haul-in speed, are greater than the chances of the oncoming plane "getting" the captive sausage.

It has been said the balloonist aloft has no way to get down except at the will of the officer below. This is not strictly so, since every occupant (there are usually two together), is strapped to a parachute. This parachute is folded into a canvas bag, attached to the outside of the basket. It is so folded that it must unfold as it is pulled out of the bag. The bag is closed with cotton cord ties, and the head of the parachute is tied into the bottom of the bag with more of the same flimsy material. The observer being strapped to the parachute has only to fall overboard; the weak cord ties break and down he goes, parachute trailing behind him. He has

(Continued on page 422)

Kite balloons resting on their "beds" surmounted by a heavy camouflage screen

How Big Guns and Kite Balloons Hide From the Enemy

EVER since the Germans shattered the steel and concrete defenses of Liège and Antwerp, back in those dark days of 1914 when the fate of Democracy hung in the balance, it has been apparent to military men and the laity that the only practical protection against big guns is concealment. For to present a definite mark against modern guns is to welcome destruction. So it came about that the art of concealment on the battlefield, known as camouflage, was introduced.

Now that military activities have virtually ceased it is possible to explain and illustrate many examples of camouflage which have hitherto remained military secrets. In the accompanying set of photographs, for example, is a complete pictorial explanation of the installation of a big French railroad gun. The first step is to prepare the roadbed for the tracks, followed by the erection of the camouflage strips on chicken wire netting, held in place by light wooden framework. Lastly, at the proper time the big railroad gun, together with its train of ammunition cars, repair car, and so on, is rolled under the camouflage cover. It is said that a big gun concealed in this manner is extremely difficult to detect; indeed, it is only by the flash from its muzzle that the gun is sometimes betrayed.

Kite balloons while on the ground, resting on what is known as their "bed," must also be protected by concealment. In the fifth illustration appears a kite balloon "park" with the balloons at rest, concealed from hostile airmen by a veritable forest of camouflage.

First steps in preparing a site for a large railroad gun

Erecting the camouflage cover for a large railroad gun

Rear view of a railroad gun, with three of its shell in foreground

Front view of a large railroad gun installed in the Somme region

Reconstruction

What Has Already Been Done to Restore Our Industries to a Peace Basis

By Hon. William C. Redfield, Secretary of Commerce

WE are beginning to hear a great deal of a thing frequently referred to as reconstruction or readjustment. It takes a great many forms and some of those forms I want to mention, because there is an impression abroad that very little has been done or is being done upon that important subject. It is, however, a fact that the Council of National Defense is making a study of the matter, and among the things that they have found it important to consider is not only what is to be done, but the very important amount of work that has already been undertaken. In a suggestion which I have made upon that subject, there are three propositions respecting reconstruction or readjustment. These three are as follows:

First of all, the American people should not approach the subject of reconstruction from the viewpoint that somebody, somewhere, somehow, is going to do them damage if they do not watch out. In other words, I do not think that we ought to approach the future with fear. We did not deal with the war with fear and the war had quite as much in it to fear as the future. Therefore, if I may quote a word from the Prayer Book, it would be that the American people should look to the coming days with a "quiet mind."

Secondly, that before we plan largely as to what ought to be done, we should inform ourselves of what is now being done or has already been done.

And, thirdly, having then acquired the right state of mind, namely, calmness and confidence, and having learned what the job is that we have to do, we should adjust ourselves to it and do it as well as we know how.

Now as to what has already been done; it is entirely possible to make a great many of the expenditures for war serviceable for peace. I received a most extraordinary circular a few weeks ago and the man who forwarded it wrote that the author of this circular seemed to him to be more or less crazy. The circular stated that all of the expenditure made for war was saved, that nothing was really wasted, that war was not at all a cause of loss but that everything that was spent in it, because it was spent for labor and for materials, was saved after all and there was really no waste! In my reply I had to say that I feared the gentleman had forgotten that the immense amount of labor, for example, expended in making explosives could have been used in making something of real permanent value if the necessity for making explosives had not existed and that there was very clearly, therefore, a loss of a product of permanent kind. But I pointed out that a great many expenditures for war can be made and must be made to serve the purposes of peace. For example, the money spent upon our merchant marine is not money which we shall waste, for when the war is over we purpose to have the ships to carry our goods across the seas. The money that is spent in developing the resources of the country is not money which is wasted. There were before the war whole industries which we did not have and for whose products we were dependent upon other countries. Take, for example such a matter as the dyestuff industry with which the public is more or less acquainted. We were dependent upon Germany for dyestuffs or almost entirely so before the war, because we allowed the materials out of which Germany built up her dyestuff industry to go to waste in our streams. Again, we did not make in this country optical glass and that highly important material needed for all fine optical instruments and lenses had to be imported from Germany. Certain grades of the finer porcelains had also to be imported from abroad. Many instances of the same sort could be cited in which we lacked the raw materials and for which we were more or less dependent upon Germany.

One of the results of the war has been to create a whole lot of new and flourishing industries in this country. We began in our own department of commerce to manufacture optical glass before the outbreak of the war and we are now running our own glass works at Pittsburgh. We are building another plant in Washington, and there are other concerns around the country. I can now say that on the important subject of optical glass for lenses and fine optical instruments we are forever absolutely free and independent of Germany. In the same way we have created in this country a great and growing dyestuff industry.

Not only have we started a lot of new industries in this country—there are many of them—but we have developed a whole lot of our own resources which we had previously neglected. You cannot make steel, for example, without using manganese. We have been content for years to import manganese very largely from Brazil, although we have it in this country in great quantities, of a lower grade ore, maybe, but still very good. We are now using six times as much of our own material as we did a year ago. The war is bringing about a development in this country of our own resources, things like manganese, chrome, tungsten and potash. I hope we shall see the time when no longer will the big cement mills permit the vast clouds of dust with which they are surrounded, but that they will extract from that dust the potash which it contains, and at the same time save the dust.

And so, little by little, side by side with the growing up of new industries in this country, there is growing up a new use of the things which we ourselves have in the way of resources. The result of it is that we shall face the period of "after the war" in these respects far more independent, far more self-controlled and self-centered than we ever were before it.

Let me pass to a phase of the matter which should be borne clearly in mind. There were two special and peculiar characteristics of German industry before the war. Out of these two arose her industrial power. In these two she differed from other nations and prospered because of them at the expense of Great Britain and the United States. These two features of German industry were

(1) The application of science to industry.
(2) Universal vocational education.

Translated into factory language this means that in every factory the science of that particular industry was first valued (appreciated), then studied, then applied to the work in the shop. Science was the controlling factor in the formation and daily operation of German industry. Out of it grew her great dyestuff industry and many others. It was widely true, it may almost be said to have been universally true, that a German industry was a means of applying science to production.

Coupled with this was the training of the workers in the theory and practice of their craft. The man at the bench or the machine knew why he did his work, why it was done just that way, and his hand had been trained how to do it. Universal industrial education added to scientific knowledge made a very formidable industrial combination and formed on the economic side the substantial reason why "Made in Germany" became known throughout the world.

With exceptions neither Great Britain nor the United States did either of these things. Among the exceptions is the great electrical industry in the United States, which applied science to its work, which indeed made its work the direct outcome of scientific knowledge and prospered. On the whole, however, scientific research was not a visible factor in American or British production. The rule-of-thumb prevailed. Scientific research was conspicuous by its absence from the average American shop. So too, on the educational side, we had no system of industrial education that was country-wide or even state-wide. There were exceptions, again, but on the whole the rule was that no opportunity was given to the worker to know the why and the wherefore of his craft, to make the trained hand follow the trained mind.

Now this has all been changed and we approach the future with conditions quite reversed from those before the war.

We have now industrial education on a good and growing scale. The federal board for vocational education, has succeeded in standardizing the industrial education of every state in the Union and is distributing to them large sums of money fixed by law and increasing every year—two and a half millions, I think, the first year, three the second, and so on; so that in every state in America there is today a definite standardized kind of industrial education in progress, and the boys and the girls of our country may know for the first time *how* to work and *why* to work in the way they are taught to work.

For the purpose of linking science and business, the government is now building in Washington in our department the greatest industrial laboratory of its kind, I think, in the world. In it we are beginning one by one to assemble the operating units of the great industries. We are just installing at the moment our cotton mill and our woolen mill. There, important problems come up continuously in connection with textiles and we work them out experimentally. A mill cannot always itself work them out, because a mill must run to earn its living. It cannot stop its looms to try experiments, because it cannot afford to; but a small experimental mill can do so—it exists for that purpose. It can study a problem patiently and painstakingly for years, until it is worked out for good and all. Suppose you wanted 500,000 yards of linen cloth of a certain width, weight and fineness. Where would you go to get that made? You would have to go abroad, because there is no large linen industry in the United States, though it is beginning, I am glad to say. For a certain military use, recently, a very large amount of material was needed for which linen had always heretofore been used; but we had no linen industry here capable of making such a quantity of linen material. We had to have it. We had to have it quickly for war purposes. We could not go to the textile mill and say, "Here, take this experiment and work it out," because they could not stop long enough to do that, and so we had it done with the help of our own experimental textile plant. We produced from American long staple cotton grown in the Imperial Valley and from South Sea Islands a cotton fabric that was just as good for the purpose as linen, if not better. It was turned over to a textile mill to manufacture and it has been manufactured ever since. That sort of problem we purpose to work out in our own little textile mill.

In the same way we have a running paper mill and the problems of the paper industry can there be worked out. Incidentally we can make in that paper laboratory out of the accumulations from our waste baskets enough multigraph paper for the use of the service. Every paper manufacturer usually at some time or other runs up against problems which he cannot stop to study or work out. I call to mind a case in which a manufacturer was interested in a contract for postal card paper. Sometimes a postal card will "drag" as if it had hairs on it. A lot of postal card paper was delivered by this same manufacturer and was rejected because of the fault of which I speak. The manufacturer said that it was all right and the postoffice department said that it was wrong. A little instrument was designed by the bureau of standards of the department, which would turn a beam of light at right angles to the surface of the paper. This same paper was tested by the little instrument developed for this purpose, and the moment you examined it by this method it was seen that the beam of light caused the hairs on the surface of the paper to show up like a small forest. The postoffice department was proven to be right. It was accomplished by applying the principles of optics to this particular kind of material—the application of science to industry. That same principle runs all through industry.

We have also a rolling mill. And that may mean safety in traveling over rails that will not break. Little by little we propose to have a place where any man can come who, in business, runs across some kind of a problem which affects a whole industry. Not a personal problem, mind you, but one which affects a whole industry and not the individual alone. There comes an appeal, let us say, for something different or better in the way of textiles and the mills say that they do not know how to make it. We purpose to have a mill where it can be worked out. We believe that there are fibers in America not now used which can be utilized. The Department of Agriculture is also doing a great deal in that direction. In all these ways we are going to try to build up an industrial laboratory, practical, scientific and useful to the business men of America.

In closing, I wish to say that two, therefore, of the big problems of reconstruction or readjustment have been tackled and are proceeding well; namely, the problem of trained labor in the *why* and *wherefore* of its work and the problem of trained capital in the scientific knowledge of its own business. Those two things may seem to be simple, but they are, in my belief, fundamental, going to the very root of the prosperity of this country; because we must go out and sell our goods abroad if we are to prosper at home. We have gone out into the great world and we can nevermore pull ourselves back into our shell. We cannot be clams any longer. We have got to go out into the world and stay out there, and in order to do it we must do our work as intelligently, as sensibly, and with as clear a knowledge as anybody else, and it is for that purpose we are establishing and putting into service these two important mechanisms for our commerce.

Coöperation of a Museum with Manufacturers

AN excellent indication of the march of events in these hectic days of grim struggle for the mastery of an ideal in human life is the spirit of usefulness demonstrated by the Metropolitan Museum of Art of New York, an institution devoted to the maintenance of the arts of peace and now doubly anxious that these arts be improved and propagated for the time after the new day has dawned when our readjusted existence and our millions of returned fighters will require that balance wheel of grace and beauty which a fine environment affords.

By those who have not considered the matter with adequate care, it may be thought that museums of art are among those so-called non-essential factors of a quiet life, suddenly made unnecessary when men's minds temporarily turn to military methods of solving their problems. The museums, however, have shown that the German point of view of peace as only the interval between wars, requires complete inversion to apply to American life and thought. War is the infrequent ugly interloper, a destroyer whose reappearance for many centuries the concluding peace of the present conflict will make impossible. Believing that the era of progress, which this war will certainly usher into the world, will see an exceptional development in the various industrial arts branches, we are glad to record the step taken by the Metropolitan Museum in the salutary direction of affording an immediate coöperation and assistance to manufacturers of decorative art objects, from furniture and textiles to garments and jewelry.

The Museum has established a department devoted specifically to the requirements of producers and dealers in industrial art objects, a department which will make every effort to render accessible the invaluable resources of the collections for the betterment of American design and craftsmanship. This office will be in charge of Richard F. Bach, of Columbia University, formerly one of the editors of *Good Furniture Magazine*. Mr. Bach's experience in the field and especially his knowledge of the nature of the design problems related to the requirements of manufacture and merchandising will make it possible for manufacturers to obtain direct assistance, so that they may henceforth rest assured that there are no unmined treasures in the splendid Morgan and other collections to which they have not immediate access in terms of their own particular problems and requirements. It is planned to make this department on the part of the Museum directly useful to all designers and producers, dealers and manual craftsmen.

Finland and the World's Next Paper Supply

The Past, Present and Probable Future of the Forests in this Corner of the World

By Cyril Arthur Player

IT is only very recently that the world has begun to understand this individual little people tucked away on the fringes of the north; the political canniness of the Finns, who seized upon the downfall of czarism, and at the same time coolly rejected the advances and pretensions of Bolshevism, is only a reflection of their progressive attitude in all their affairs, social and industrial. The Finns are distinctly a western people, and now that the west sees them as a political entity, a nation thoroughly determined to take its place in the commercial affairs of the world, there will doubtless be many inquiries as to what exactly Finland expects to contribute to the material side of civilization.

Finland's answer is in the forest, water and rock which make up the characteristics of a Finnish landscape, and from which the wealth of the country is destined to spring very rapidly in the future. Even deducting the marsh land and bog, an enormous surface of dry forest remains. Both the geological formation of the greater part of the country and also the climate are favorable to forestry, far more that to agriculture; and the natural regrowth of the trees is unusually rapid.

In early times the State claimed for itself all waste lands; today these Crown lands, or that part covered by forests, total 13,000,000 hectares, or 32,000,000 acres; of this less than half is dense forest with thick growth. The private forests amount to 25,000,000 acres of good forest land, and about 5,000,000 acres of marsh land.

The difficult work of transport is facilitated by two circumstances. There is always sufficient snow in the winter to make it easy to bring down the logs from the forest, while the snow is not so deep as to make the cutting of the timber difficult. Then, the country is laced by an enormous network of waterways. One great basin, the Saima, extends 360 miles inland, and there are many other important chains of lakes, and numerous navigable rivers—that is, navigable for logging. Thus logs can be floated down to the coast at a low cost. More important still, nearly all the rivers through which the lakes have issue have a large number of rapids and are capable of producing an enormous degree of water power, for the mills.

The history of the forests of Finland, down to a comparatively recent date, was discouraging. At first, the forests were merely hunting-grounds; then they were used for buildings and for fuel; after that period they were burnt down in order that the soil might be fertile for crops. Reindeer also have been responsible for a great destruction of trees, and the ignorant topping of trees to provide fodder has been another source of loss. The worst feature of all was the wholesale disposal of forests to speculators by ignorant peasants. The purchasers, to whom the forests were almost a gift, ravaged them, and rarely thought of replantation.

Finland's first Institute for the training of foresters was opened in 1859, from which event dates the first serious consideration of scientific forestry. A few years later it closed for lack of students, but reopened in 1874. The steady increase of the timber export has been the greatest educational factor, and today the farmers know the value of their trees, and exact their price. Also, the larger companies are improving their forests by draining, thinning out their trees, and replanting.

The principal trees are the common pine, the fir, and the birch; others are alder, aspen, larch and oak. In 1910 there were 531 saw-mills, not counting a considerable number which worked only to supply the needs of the owner or the commune. The noteworthy feature is the considerable use of steam-power at the mills instead of water. The two reasons for this are, first, that their position was determined by other considerations than the accessibility of water power, and that such power is not essential in saw-mills because sufficient fuel is obtainable from the waste products of the mill. While the raw material of the saw-mills is derived from the fir and pine forests, passing mention should be made of the bobbin industry, which utilizes the birch. A very large amount of wood is required, as there is a wastage of more than 90 per cent. Also birch logs cannot be floated down like fir and pine logs, but must be transported on barges. There are 15 bobbin factories in Finland.

The saw-mill and bobbin industries are, however, far exceeded in importance by the paper-mills of Finland, whose phenomenal growth since 1885 should command serious attention. Here water power is of high importance, and in 1910, the mills were using 77,200 effective horse-power, and the amount has steadily increased since. Three-quarters of it was used in the pulp factories, most of the rest in the paper factories, about 3,000 horse-power going to the cellulose factories. In 1910 there were 110 electric generators in use.

The paper mills usually are named after the rapids by which they are situated, and from which they derive their power, and end in -koski, the Finnish for waterfall. The value of paper output in 1912 was 93,000,000 marks; this figure grows more significant by comparison with the output of 1885, when the value was 9,000,000 marks, and in 1905, when it had reached 41,000,000 marks. (The Finnish mark is equivalent to the franc.) Russia for years received the benefit of this industry and took most of the paper export, but other countries have gradually entered the market and, in the two years from 1909 to 1911, the exports to countries other than Russia leaped from 3.2 per cent to 21.8 per cent. Three years before the war Great Britain, Finland's best customer after Russia, took 87,500 tons of ground wood pulp, cellulose, paste-board, and paper, of which nearly 20,000 tons was paper.

The owners of forest lands are rushing into the paper-mill business as fast as they can, and are deserting the saw-mill for that purpose. A standard of sawn goods brings in some $35 or $40, while the same quantity of wood turned into rough paper brings, at pre-war prices, from $150 to $250. Another important fact is that the export of the more expensive products is increasing at a far greater rate than that of the coarser products. It has been estimated that if all the whitewood now exported as raw material for paper-making in other countries and as planks, battens and boards were converted into paper, the paper export could be increased fourfold or fivefold without cutting down any more trees than is done now.

The failure of some of the early paper-mills was inevitable. The chemical process by which paper is made out of wood was only invented some thirty-odd years ago, and the early paper-mills have had to be rebuilt and the installations changed as the technique developed.

Finland's part in the war, until very recently, was negligible. The larger towns, such as Tammerfors, turned to munition making, and wages went up all over the place as much as 130 per cent. Naturally other industries have suffered. This munition industry, of course, is transient. Moreover, as great want exists in Finland, the money paid in wages, to a large extent, is resting in the savings banks, there being very little of anything to be purchased "for love or money." This accumulation of capital will put many of the Finnish coöperative companies—and coöperation has reached a high development in Finland—on a stable basis to continue the profitable operation of their paper-mills, and the development of the country's foremost industry.

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

An Old Friend

To the Editor of the SCIENTIFIC AMERICAN:

In securing the SCIENTIFIC AMERICAN for the year 1919, I am glad to note that your paper is just as good in war time as in times of peace. As the year that I am sending for is my fifty-third, I feel that I am making no mistake.

Calais, Me. F. N. DAVIS.

The Successful (?) Cotton Picker

To the Editor of the SCIENTIFIC AMERICAN:

Just a few a few lines from one of your readers about that "successful cotton-picker" which the cold and fishy harvester trust has adopted. As Mephisto said to Faust, "She is not the first." We don't know how many successful pickers there have been; but the last one came here in 1914, I think it was, and I guess you didn't overlook it. Any way it was heralded by one of the technical journals as *The* picker, preceded by a history of the many previous unsuccessful pickers. That picker came from Pittsburgh; at the end of the season it went back there and I guess it must have met with a Boojum for like the hero of the famous snark story, it "silently vanished away and never was heard of again." So we cotton-growers are interested without enthusiasm.

A number of objections occur to one reading your published description. However, they may not be well founded, so I will just refer to one or two statements made in your article not exactly correct. Cotton-pickers to be sure vary greatly in picking capacity, but I will not be far wrong in saying that an average negro, man or woman, will pick 400 pounds (not 100 to 200 as you have it) of cotton a day, for the simple reason that they make $5 to $6 a day with wages at $1.25 per 100 pounds. Some do not make as much, neither do wages always run as high. "Six bits" (75 cents) was good wages two years ago. This year wages started at $1 and ran up quickly to $1.25 and then to $1.75. Some probably paid more, but this is what we paid at the last. When farmers begin to get scared for fear of rain, for the cotton opens up quickly and simultaneously over a large area, they all bid against each other and steal one another's hands, so wages go up faster than new hands can come in. Hands were scarcer than ever this year, but there are always a large number of city people, especially negroes, that make it a business to pick cotton because they make big money at that time. So there is far less danger of a real shortage of cotton-pickers than there is of labor for other crops.

Now when you say cotton-pickers are wasteful, and waste up to 50 per cent of the crop, I can only say that this is pure nonsense. There isn't any of the crop wasted, that can be profitably picked. If a picker does not pick clean, it is easy to see that fact, and he must go over the row again. Besides, there are always two pickings, usually three, to every crop, because the bolls continue to open, usually, for one to three months. The last picking is called "scrapping," the scrap being of inferior quality, and worth less; so when cotton is very low, as it was up to 1915, such picking is often neglected as indeed it does not repay the labor. The mechanical picker might save a little of this, but it would do the farmer no good, as when cotton is low that is just when this scrap should be kept off the market.

There is one other point to which I wish to call your readers' attention, as undoubtedly everybody outside the cotton-belt will be comparing the present price of cotton with the cost of harvesting. No less a journal than the New York *Times* remarked in a recent issue that as the cost of picking comes to only 1 to 1½ cents a pound, it does not seem to amount to much. The writer of this remark evidently had in mind the price of cotton quoted on the exchanges. Of course that is not the cotton the grower pays 1½ cents a pound for picking. The latter is seed-cotton, to wit, it contains both seed and lint. It is generally figured that there are two pounds of seed to one of lint; but if a grower gets 900 pounds of lint out of the gin to 3,000 pounds of seed-cotton he is doing quite well, and I doubt if he ever gets 1,000 pounds as there is always some shrinkage in ginning due to trash and burs and the lint that sticks to them. So the seed-cotton, this year, with cotton around 30 cents, is worth only 10 cents a pound (this includes value of seed) and in 1916 it was worth only 6½ to 7 cents. You can easily see that 1 to 1½ cents out of this makes itself felt.

If your new machine can be put on the market at a price that people can pay—say $500—or such that it would pay for itself in one season, it can be bought and used in sufficient numbers to make itself felt as an influence which would enable us in the fall to do something else besides pick cotton, and there are lots of things that have, or ought, to be done; and if, of course, it can pick successfully—then it may be a success. The last machine cost around $5,000 and I don't wonder it wasn't a "go."

Rosharon, Texas. GEO. W. COLLES.

Road-Town

To the Editor of the SCIENTIFIC AMERICAN:

A few years ago this writer was much impressed with a magazine article illustrating and describing Chamblee's Road-Town.

Since that time nothing has appeared with regard to it that has met our attention, and we just wonder if the SCIENTIFIC AMERICAN was acquainted with and took notice of the merits of the proposition at any time.

It appealed to us at this time as combining the merits of rural and urban life and would solve the problem of city congestion and country depopulation at the same time.

However it would probably be practicable only for the more thickly settled communities.

Mr. Chamblee was probably never able to promote the scheme because it is essentially a collective rather than an individual proposition. It does seem to the writer, however, that right at this time, if the powers that be in Europe had it properly brought to their attention, it might be tested out in a practical way in northern France. That region combines agriculture with manufacturing and is thickly populated, and must be rebuilt by or through Government aid, if not by entire public ownership. Hence we trust the Road-Town may be presented to the proper authorities over there.

NAT. M. PICKETT.

Madison, N. C.

Experiments on Silver Sulphide

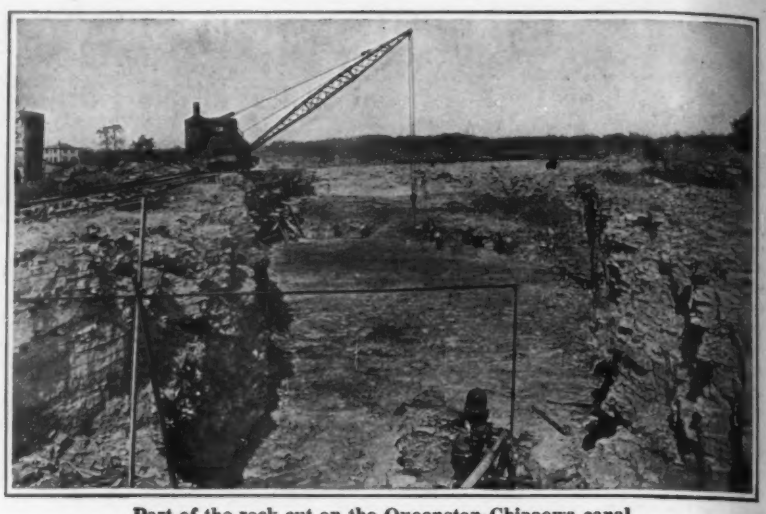
To the Editor of the SCIENTIFIC AMERICAN:

We note on page 247 of the issue for September 28th, of the SCIENTIFIC AMERICAN, a resume of recent experiments made at the Bureau of Standards on the metallic properties of zinc sulphide. This is an error, since the experiments were made on silver sulphide and not on zinc sulphide.

G. W. STRATTON,
Director, Bureau of Standards.

Washington, D. C.

Queenston Heights, at the base of which the power plant is to be located



Part of the rock cut on the Queenston-Chippewa canal

Canada's New Niagara Development

A 300,000-Horse-Power Plant Below the Rapids

By Arthur C. Carty

RACING against the menacing spectre of a fuel and industrial power famine, the Hydro Electric Power Commission of the Province of Ontario, Canada, is now engaged at Niagara Falls in a new 300,000 horse-power electrical development project.

Spurred by an ambition to provide much-needed additional energy to operate munitions plants on both sides of the international boundary line, and hindered by labor shortage the Commission has placed its reliance on mechanical equipment of the highest order. Topping the list is a double tracked, electrified railway operating 18 standard locomotives; excavating apparatus which for capacity and speed has not hitherto been approached; and compressed air equipment, which in itself is the equivalent of regiments of workers.

The project, known as the Queenston-Chippewa Development, entails the expenditure by the people of Ontario, of more than $25,000,000, the purchase of upwards of a million dollars worth of farm lands, the reversal of the direction of flow of the Welland River for a distance of more than four miles from its mouth, the construction of a new 12¾-mile canal the excavation of 15,000,000 cubic yards of earth and rock, the creation of a new artificial Niagara Falls at the cliffs of Queenston Heights, and the utilization of 305 feet of the 330-foot difference in the levels of Lake Erie and Ontario.

Although it has been possible to secure only 3,000 men thus far the Commission's four million dollars worth of construction apparatus is achieving such results that engineers are able to report that they are well ahead of the schedule which calls for completion and delivery of power in the spring of 1921.

The executive brains behind the scheme are those of Sir Adam Beck, chairman of the Hydro Electric Power Commission.

The SCIENTIFIC AMERICAN of June 1st, 1918, made incidental allusion to the Queenston-Chippewa scheme in dealing with a proposal to dam the Niagara River, and generate power for both countries on the Canadian side. The project now under way has been designed with a view to international utilization, and while no dam has been proposed below the intake, sufficient land has been purchased for the construction of two additional paralleling canals to the Queenston power house.

F. A. Gaby, Chief Engineer of the Hydro Electric Power Commission developed the plan and under his personal direction it is being carried through.

The conservation of energy has been the principal consideration in the formulation of the whole project, for the Niagara Power zone in Ontario is now handicapped by a shortage of 100,000 horse-power, the demand is steadily increasing and international treaty limitations at present forbid the diversion of more than 56,000 foot-seconds for power purposes, lest the scenic beauty of the Falls should be marred.

Digging out the shovel after the slide

The allotment of water to Canada, under the treaty of 1910, is 36,000 foot-seconds, and to the United States 20,000 foot-seconds, the apparent inequality being due principally to the fact that 95 per cent of the water of the Niagara River flows over the Falls on the Canadian side of the boundary. The arrangement was also influenced in part by the diversion of water from the Great Lakes as part of the Chicago sewage canal scheme. The total power now generated at Niagara Falls in power houses on both sides of the boundary is 653,500 horse-power, of which 265,000 horse-power is generated on the American side and 388,500 horse-power in Canada. But the Canadian authorities license the exportation of 110,000 horse-power to the United States.

Thus the 100,000 horse-power shortage in the Niagara Zone of Ontario is aggravated, and more than a million people are made absolutely dependent upon the restricted allotment of American coal. The Hydro Electric Power Commission, which is at present operating 12 hydro electric systems in different parts of the province, has, since its inception in 1910, built up preëminently the greatest electrical distributing organization in the world. Two hundred and twenty-five municipalities are served with more than 1,900,000,000 kilowatt hours per annum. The Commonwealth Edison of Chicago, whose annual output is 1,500,000,000, was dislodged from first position by the Ontario Hydro Electric Power Commission and has now dropped to third as a result of a California merger that gives one management there a record of 1,500,408,765.

The power from the new development will be distributed in the territory between Toronto and Windsor, over the well-established transmission system. This includes 450 miles of 110,000-volt steel tower lines, the longest line of which terminates at the Detroit River, 250 miles from Niagara Falls. And since the lines are of sufficient capacity, and the principle of exportation of power over the international boundary (into New York) has been set up, the belief is held that the long deferred proposal of a submarine cable to serve the people of Detroit with cheap power, will soon materialize. Ontario with plenty of power will be glad of the opportunity, for increasing the load on any line distributes the capital charges, and thus effects a further reduction in rates for everyone on the system.

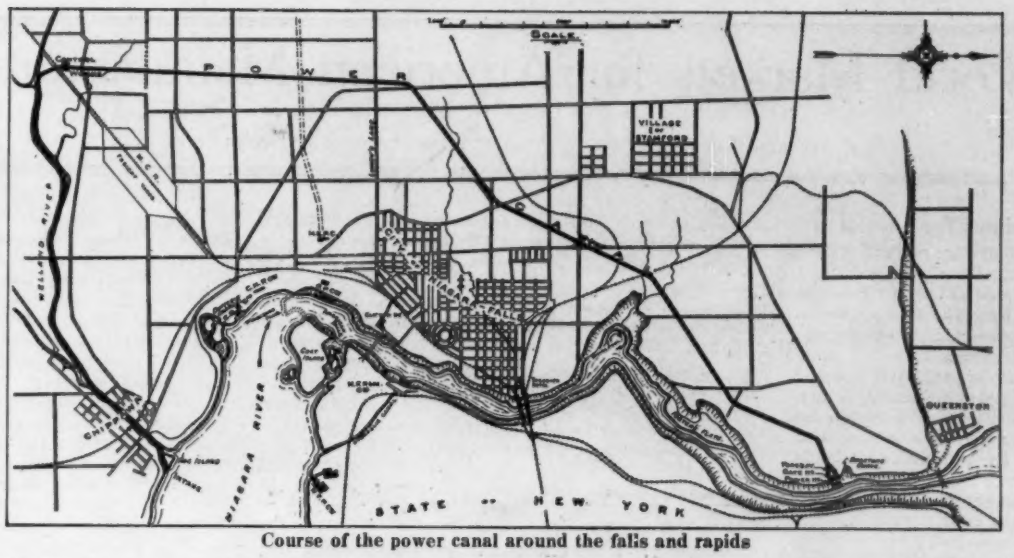
Only 6,610 foot-seconds of Canada's allotment of water remained available for the Commission when it came into being, but within the past year the Ontario Power Company has been acquired with its rights of 9,985 foot-seconds. Expectations are that the Commission will eventually acquire all plants on the Canadian side, some of which are using water under a net effective head of only 135 feet. As the demand for power increases such plants are to be scrapped in the interests of efficiency.

Making a pilot cut for one of the big shovels that is to follow

One of the big shovels at the bottom of the canal buried by a slide of earth

Water will be taken to the new Falls at Queenston Heights, where 14 horse-power, will be multiplied by the increased head, to 30 horse-power.

The power house site selected by the Commission's engineers is capable of expansion indefinitely for the prospect of American co-operation in the interests of economy has been kept constantly in view. The whole Queenston - Chippewa Development scheme in fact is built up from the primary selection of the best intake and the best possible outlet on the Niagara River. The mouth of the Welland River, at Hog Island, just 12 feet below the level of Lake Erie is the starting point, while the tailrace at Queenston, three-quarters of a mile above Lewiston Bridge, is only two feet higher than Lake Ontario.



Course of the power canal around the falls and rapids

Water diverted from the Niagara River is to be taken back along the Welland River for 4¼ miles. The current of the stream will be reversed by the removal of 2,000,000 cubic yards of material, but in the whole river section a fall of only six inches is provided for. The excavated canal begins at Montrose and follows a course 8½ miles long, with a gradient of but one foot to the mile. Friction in the penstocks will account for 2 feet 6 inches of head, and in addition there will be an 11-foot loss from intake to tailrace. Thus the net effective head of 305 feet for power development is computed.

The major portion of the canal is in rock. There the cut will have a width at the bottom of 48 feet, with almost perpendicular sides. The wetted section will be 35 feet deep and in order to obtain a velocity of six feet per second under maximum load 10 channellers, capable of making a 20-foot cut, are rifling the sides. The earth section is being given different treatment. There the top width will be 162 feet and the bottom width 34 feet 6 inches, the average wetted section being 26 feet deep and the width at the mean water line being 84 feet. The sides, sloped 1½ to 1, are to be smoothed and concreted as a means of minimizing friction.

This treatment of the walls of the earth section is proving most advantageous, for thus far only one serious slide has occurred notwithstanding the fact that a depth of 145 feet is reached in one cut. This slide came in on the front of one of the 715-horse-power electric shovels, which was engaged in the stupendous feat of cutting against a 100-foot face, and loading 40-ton dump cars, on a track 62 feet above, at the rate of one every two minutes. Unstable material on the slope of bad rock which the shovel was approaching was responsible, and though the big machine was temporarily disabled, the earth is being taken out in the ordinary course of the job and no extra yardage is entailed.

The average depth of cut on the northern or rock section is 50 feet, and on the southern earth section, 80 feet. Much of the earth is being used to fill the old Whirlpool Gulley, and as rapidly as new ground is made it is handed over to a division of the staff which prepares it for agricultural production. The rock on the other hand is carried by a system of conveyors, to crushers, and thence to the Commission's railway. There it is available for such construction as the building of the four 100-foot span railway bridges to cross the canal, or it is offered for sale for roads or general purposes.

The forebay is capacious while the perpendicular character of the cliffs permit the use of penstocks only 450 feet long.

Four steel tubes, each 13 feet 6 inches, will be the initial installation to serve four 50,000 horse-power generator units. Before that power is taken the commission hopes to have evolved 100,000 horse-power units. Progress in their design is now being made.

The utilization of electricity and compressed air in every conceivable manner, gives promise of saving 50 per cent in labor and power costs. The $3,000,000 railway is equipped with twelve 50-ton electric locomotives, six 40-ton steam locomotives and 150 air dump cars of 40-ton capacity.

But perhaps the most interesting equipment is the battery of electric shovels. The two greatest are equipped with 90-foot booms, and 58-foot dipper sticks that enable them to load cars, as stated, 62 feet above their own level. The shovels, each of which weighs

(Continued on page 422)

Intrenching tools and material captured by Canadian troops on the Somme front

Spoils Which Go to the Victors

IT is in the very nature of military things that the defeat of a modern army should spell heavy losses in supplies of all kinds. Such vast stores of materials and supplies must be brought up close at hand for an offensive operation, that it becomes impossible to remove them in the event of enforced retreat. And this the Germans have learned from first-hand experience in a series of great defeats inflicted by British, French, Belgian and American troops, dating from the great counter-offensive of July 18th to the recent signing of an armistice.

Some idea of the military and other stores which fall into the hands of the victors can be gained from the accompanying illustration, which shows the picks, shovels, barbed-wire stakes, and other intrenching material which were captured by the Canadians in the Somme area. When the story of the great war is given out to the world, there is but little doubt that it will show how the losses in telephone and telegraph material, intrenching tools and supplies, artillery, munitions, food, and other military supplies played an important part in bringing the Germans armistice delegation to Foch's headquarters. In fact, it is very likely that the losses in supplies, rather than in men, caused the premature collapse of Germany's military machine; for at the time the armistice was agreed to Germany still had a sufficient number of troops for a desperate resistance along her frontiers.

The Smoke Screen of the City of Paris

AS a protection against the occasional German bombing planes that made their way to Paris, the authorities in charge of the military defense of the French capital introduced the smoke screen on a large and practical scale.

It appears that many stove-like devices of the type shown in the accompanying illustration, were placed in various parts of the city. These devices produced great volumes of thick smoke in a short space of time, which formed an impenetrable blanket or cover for the entire metropolis. Thus the visibility of the Hun airmen was entirely destroyed, and the purpose of their raid largely, if not totally, foiled in consequence. If the German raiders elected to come down nearer to their objective, they ran the great risk of being shot down by anti-aircraft fire; so that such a risk was seldom incurred and the smoke screen proved perhaps the most effective weapon against airmen who would bomb definite structures or points of a large city.

Copyright, International Film Service

One of the smoke-producing devices employed for the anti-aircraft defenses of Paris

How Allied Propaganda Was Spread Among German Soldiers

IN the closing days of the great war the Germans were not only bombarded with the ever-increasing fire of thousands of guns, but with countless booklets and leaflets and other forms of propaganda. Indeed, most armies in the great war had established propaganda departments whose duty was to present certain facts to enemy troops, with a view to altering that important force of all troops known as "morale."

The American Propaganda Department has maintained a big printing establishment in Paris under the command of Captain Arthur Page, formerly the editor of *The World's Work*, while the editorial work was carried on under the direction of Walter Lippman, formerly of *The New Republic*. The American propaganda has been mostly in the form of the speeches and notes of President Wilson, together with interesting facts concerning General Pershing and his legions. In some leaflets the Germans were invited to partake of the excellent food and tobacco given to prisoners in Allied hands.

To what extent the propaganda of the Allies served to demoralize the German troops may never be known. That it had considerable effect upon the enemy is proved by the anxiety of German commanders to prevent our literature from reaching their troops, and by the German efforts to counter such propaganda not only behind their lines but also over our

(Continued on page 422)

Copyright, Western Newspaper Union

Sending up British propaganda balloons on the Western front

World Markets for American Manufactures

Edited by LYNN W. MEEKINS

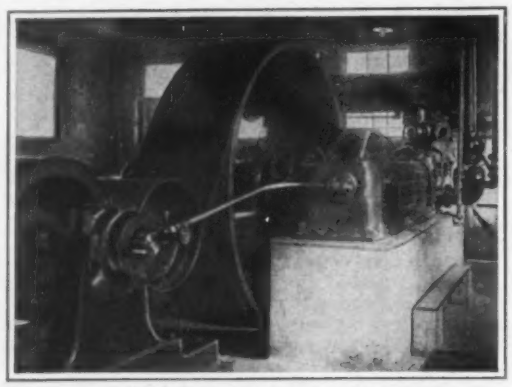
A department devoted to the extension of American trade in foreign lands

American Mining Machinery for Chosen

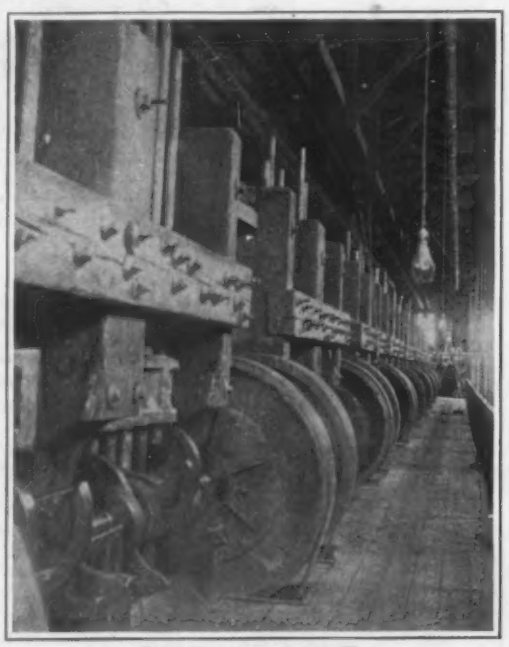
ONE of our best Asiatic customers for modern mining machinery is Chosen, formerly Korea, which bought $177,169 worth last year, being second only to Japan in its purchases of this equipment from the United States. Chosen is also a larger user of other kinds of American machinery, its imports in 1917 having increased more than 700 per cent over the previous year. Gold is the most important of Chosen's natural resources, and a number of the principal mines are being operated by American companies or by means of American capital.

The natives of Chosen have the reputation of being natural born miners, but their crude methods of prospecting yield little profit except in rare cases. Once in a while a native strikes a rich vein and immediately becomes a man of importance, "showing off" by acquiring several additional wives. About sixty miles south of Seoul, the largest city in Chosen, lies a concession originally granted to a Japanese company, but now controlled by American capitalists. Last January this company decided to experiment with a large dredger, which was bought in the United States at a cost of about $150,000. By means of this dredger the gravel and sand, having passed over the gold tables, was sifted through specially designed sluices and thrown back about 35 feet, then covered with from 10 to 12 feet of soil, the land being reclaimed for agricultural purposes. The successful operation of this dredger has attracted the attention of numerous mining companies, and it is likely that more American dredging equipment will find a market after sufficient areas are opened. Compressors, stamp mill apparatus and other machinery have played a leading part in the steady development of Chosen's mining industries. There are deposits of anthracite, iron and graphite in Chosen and a large iron foundry is soon to be erected. In 1915 there were 13 electrical companies. A subsidy granted by the Government to various enterprises has resulted in the more general use of machinery, 72 factories having been established during 1915-16.

The cessation of imports of metals and machinery from Europe early in 1916 gave American metals and machinery an opening, and their hold on the Chosen market can be retained after the war if American exporters pay sufficient attention to the field. "New lines of trade must be opened as old ones are supplied more and more from home industries or from Japanese products," is the advice of an American who is familiar with Chosen. "The best way for an American manufacturer to serve his customers is by having a competent salesman personally visit the country at more or less regular intervals to look after and build up the trade. This was what a certain watch company did. Its business in Chosen was small, the local supply coming mostly from Europe until an able American salesman visited Seoul. He had his ups and downs, but he has the trade so well lined up that the local watch dealers now visit him at his hotel instead of his having to go to see them. If an American exporter hasn't enough business in sight to send a man to Chosen, he should cover the country through his agent or representative for Japan."



An American compressor used in Suan mine, Chosen



Interior of a stamp mill in Chosen

Head frame at the Charabowie mine

Export Licenses for Samples

FEW branches of the Government have received a greater profusion of brickbats and bouquets than the War Trade Board. Its organization had to be perfected, just like the Liberty motor, and when it began to run smoothly, it came in for its fair share of praise. The War Trade Board, however, has been concerned with the problem of the present, the economic defeat of Germany, and extensive preparation for the future is too much to ask of it. Many exporters have been hampered in their plans for capturing after-the-war business, because the War Trade Board has been too deeply occupied with big things to pay sufficient attention to little ones. In September a long established supply house in the Middle West received a request from a firm in Bombay for samples of certain cloths. "Our applications for licenses covering these samples, which consist of only a few grains of dyes, have been systematically refused," complained the manufacturer. "How can you expect us to open new markets for American dyes if we are not even allowed to send the thinnest samples enclosed in our correspondence? From one of the Mediterranean countries we had an inquiry for a sample of a certain color to be used on tin. We experimented with this color and had it painted on a small piece of tin about an inch square, but the War Trade Board didn't let it go through because tin is on the conservation list. Can you blame us for being discouraged? Dye manufacturers in other countries are making vigorous efforts to distribute their samples in prospective markets. As parcel post service is not available from the United States to all countries, there are many instances in which samples must be sent in letters if at all." Here is the complaint of a paper manufacturer: "Is it fair that we cannot send samples of paper through the mail in a regular letter, the samples not weighing as much as the letter itself?"

There was so much criticism of this kind that the War Trade Board recently issued a ruling permitting the exportation in reasonable quantities of samples having no commercial value. It would have helped a lot if the term "no commercial value" had been defined, but it is hoped in export circles that the War Trade Board will place a liberal interpretation upon it. Briefly, the new procedure permits travelers to carry in their personal baggage samples of no commercial value of any commodity without an individual export license. Other provisions facilitate the sending of samples by mail, articles not on the conservation list not needing a license when sent to specified countries. Those articles requiring individual licenses may be exported freely under prescribed conditions. There are no restrictions upon the sending of samples by mail to the United Kingdom, France, Italy and Japan. The adoption of this procedure is encouraging and seems likely to remove what has been a serious obstacle to foresighted exporters.

Trade to be Had for the Asking

WHEN Colonel Roosevelt penetrated the jungles of Africa some years ago, he not only brought down some big game but also gave the United States some good advertising. Since then our exporters have had the opportunity to bring down some bigger game in the shape of a profitable trade that is like a ripe apple on the tree waiting to be picked. It is truly surprising how much South African trade has come to American manufacturers and how little interest they appear to have taken in that distant but attractive market.

"Although freight rates from England to South Africa have been much higher than those from the United States," said a recent visitor from Cape Town, "about 17½ per cent of the imports last year were American goods, most of which competed with English manufactures. This proportion was larger than that of the United States and Germany combined during the three-year period before the war. Few parts of the world have been less affected by the international disturbance than South Africa, where trade in general has suffered very little. American goods are liked down there, and we want more of your mountain-climbing automobiles, your serviceable agricultural machinery and scores of other things. We are particular, though, in South Africa, and your exporters should make their products conform to local tastes and requirements. New lines should be introduced whenever possible by personal representatives of the manufacturers. Then, of course, there should be better shipping facilities and reasonable rates, but after the war that difficulty will soon be settled. Then, too, it will be possible for your shippers to quote on a c. i. f. basis, so that our importers will know what the goods are going to cost laid down at a South African port."

An American exporter with long experience in South African trade says that the methods adopted by our manufacturers in that field have not always produced the best results. American trade has been placed at a disadvantage because local merchants have been appointed agents and depended upon entirely for building up new business. Nine times out of ten, these merchants push competing lines—chiefly British—more energetically, and the American goods, left to shift for themselves, are at a decided disadvantage. The American products that have become popular in South Africa owe their success to having been introduced by experts, men who were loyal to their employers and entirely familiar with the articles to be sold. Staying on the ground and building trade gradually but permanently, these men have done more effective work than could have been accomplished through any other means. With freight rates as high as they are now, the costlier lines of American goods, such as high-priced automobiles, haven't a chance in South Africa. One passenger car that sells for between $2,000 and $3,000 in the United States is priced at $5,500 down there.

Developing South African Commerce

South Africa has matured rapidly during the past four years. It used to depend largely upon its mother country for food and clothing, but now that the farmers have adopted modern methods a larger area is under cultivation, and some products, notably dairy supplies and grain, are being exported, and the country has become self-supporting for many of its needs. South Africa now has more than 4,000 factories giving employment to over 100,000 persons. It has an unlimited supply of water power and industrial development is progressing rapidly. Some of the many industries started during the past year are turning out food products, drugs, chemicals and cement. South Africa is truly on a gold basis. Its chief industry, gold mining, has increased during the war, and that metal, comprising four-fifths of its total exports, provides three-fifths of its total revenue.

Here are the articles valued at $500,000 or over which the United States exported to South Africa in the fiscal year 1917: Plows and cultivators, passenger automobiles, drugs and chemicals, cotton goods, mining machinery, sheets and plates, boots and shoes, oils, paraffin and zinc. In South Africa, as in other parts of the British Empire, the part played by the United States in the war has created a friendship for Americans and a liking for American goods that could not have been developed in any other way. The people of South Africa want to buy from us and to obtain a larger share of their trade it is only necessary for American manufacturers to cater to their preferences and to improve delivery service, which our vast merchant marine will make feasible.

Substitute Bread

By Kurt Heppe

IT may be surprising to the layman to learn that bread can not be made without wheat or rye.

Spongy bread owes its vesicular texture to gliadin, a glue-like body, which is part of gluten; and only wheat and rye contain gluten in sufficient quantity. The other cereals are not only devoid of the required amount of gliadin, but have other objectionable characteristics.

Bread, in order to be palatable, must be made of those flours, which absorb but a certain amount of moisture. So called substitute flours, those made of barley, corn, rice, etc., can not be kneaded. In other words, they have not sufficient viscidity to hold together.

The Food Administration offered several prizes to the hotel-baker who would produce a sandwich loaf, made entirely from substitutes. Now, this feat was known to be impossible to bakers. But the impossibility is probably not equally well known to the general public. In any event, in striving for the prize many interesting results were achieved.

The great obstacle to be overcome was the cave-in of the dough in the oven. This is due to the fact that substitute flours hold only a part of the yeast-gas; when the gas expands in the heat, there is no viscid gluten to bar its way. In consequence the dough becomes soggy and unpalatable.

The writer partly overcame this defect by using egg-yolks with a stiff starch paste, called in pastry-cookery "pate a choux." In addition some dissolved tragacanth and the whipped white of the eggs was added last, in order at least to produce cellular air bubbles.

It was found, however, that with ordinary doughs no appreciable results could be achieved. But when using every "bread-improver" to be found on the market and when employing only the carefully milled substitute flours, a bread eventually was baked which was edible.

The best results were obtained with selected corn flour. Barley proved to be somewhat bitter, heavy and brittle. Rice was unresponsive to the ferment and behaved almost like sand. Oats absorbed too much water, and tapioca, and potato flour not only were very expensive, but owing to the fact that they were pure starches, could only be used as admixtures.

Buckwheat, though not strictly a cereal, showed the best results. It raised with the gas. But it makes bread very dry, and gives it a peculiar flavor. It can therefore only be used in small quantity. In combination with carefully milled corn flour, with malt, yeast-food and corn sugar, a loaf was produced which had great resemblance to what the laymen would call "natural" bread. In Fig. 1 we give an illustration of this loaf and in Fig. 2 we show a cross-cut which gives a good idea of the texture.

Such bread, among bakers, would be considered impossible. It is possible only by using bread-improvers and carefully milled materials. It is, however, neither practical nor cheap.

If chemistry would put at our disposal a substitute for gluten, then bread could be made out of pea or bean flour. In fact, it could be made out of any flour; even out of ground fish. Famines, therefore, would then be impossible. Fish could be dried, ground and transported.

But chemistry has not given us this much wanted substitute. Until now it was not really required, and without great need of it, there would have been no money in it. Wheat has of late years been so plentiful and cheap that nobody dreamed that a bread shortage might ever again face the world.

And yet wheat, that wonderful plant was not always plentiful. While it was known to the ancient Egyptians, it was even then considered somewhat of a luxury. Barley, which grew abundantly, was freely mixed with the more highly prized wheat. But bread with the ancient Egyptians was not fermented. Yeast was then unknown, and sour dough was not looked upon with favor by the priests.

Although bread was baked in at least 16 varieties, it was all produced in the form of flat cakes. Much of it was fried in oil. Wheat requires a favored soil, and rye, which is more hardy, was better known in the colder and less cultivated parts of Europe. But even rye was cultivated only by the Romans. The older people did not know it.

The Aztecs had a plant, "the Quinoa" which took the place of wheat. It is a grass and has tiny mustardlike seeds. Owing to the ravages of the Aphis it has almost entirely disappeared. But it made good bread and cakes.

Owing to the scarcity of wheat in Europe we may be forced to eat our bread with an admixture of 50 per cent substitutes during the reconstruction period. This would not be a calamity, although the bread would not be as good as it used to be.

Loaves, whole and cut, contrasting successful and unsuccessful attempts to meet the flour regulations. Full references in text

In order to show what such bread looks like we made three loaves (Figs. 3, 5, 7 shown cut at 4, 6, 8, respectively). Loaf 3 is made entirely from corn, 5 entirely from corn, with buckwheat and bread-improvers; and 7 from corn and wheat, half and half, without bread-improvers.

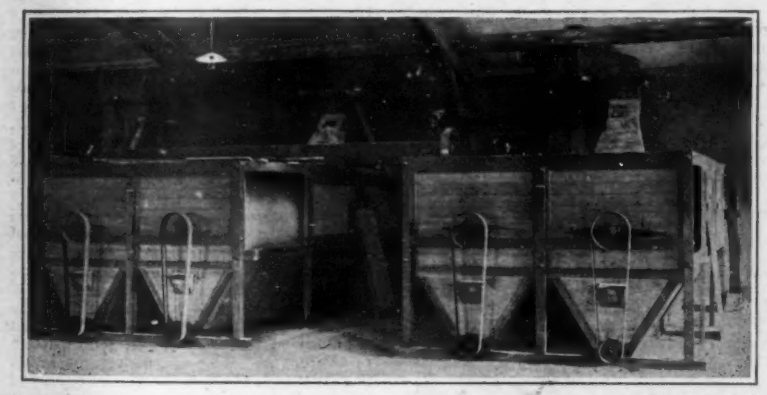
It will be noticed that the two latter loaves are almost identical, only 5 is somewhat caved-in. This could have been prevented by putting it into a terrific heat, as was done with loaf 1. Such heat solidifies the top-crust before the gas has a chance to escape. Then when the pressure of the expanding gas becomes very strong it collects in a pocket underneath the top-crust, as is plainly illustrated in the half wheat loaf 7. Figs. 4, 6, 8 illustrate this latter feature to perfection. Here the glutinous wheat dextrinized into a firm crust and effectively barred the way to the gas.

In Figs. 9-10 and 11-12 we show the difference between carelessly milled corn flour and that produced with all precautions. These two cones were baked in glass. They were of equal weight before baking; they were raised in the same room for the same length of time, and were baked equally long in the same oven. The porous cone was very well flavored, while the solid one was almost inedible.

The Poilu's Daily Bread

THE Frenchman is a great bread eater, especially when he has donned the horizon blue and become a "poilu" in name and in fact. To provide something like 750 grams of fresh bread for each man has been one of the problems of the French army, and long before the war the plans were laid for a vast military bakery. Taken by itself the mere fact that the poilus have never missed their daily bread is proof enough that the bakery plans were well laid and satisfactorily executed.

Two types of military bakeries have been employed in the French army, namely, the permanent, immobile bakeries of large production, and the mobile and limited bakeries. The former have been established at large centers where the bread could be expedited to the troops in a minimum time, while the latter have been provided for those troops up in the very forefront of the battlefield. The permanent bakeries have been established and maintained on a gigantic scale, as witness the accompanying illustrations of the bakery of the fortress of Paris. Everything that could possibly be done by machinery is thus handled, with the result that the output from the permanent bakeries has been exceedingly great, thereby lightening the work of the mobile bakeries in the field. Incidentally, the stationary warfare which ensued as a result of the continuous lines of trenches of both sides, has proved ideal for the distribution problems of the large and permanent bakeries.



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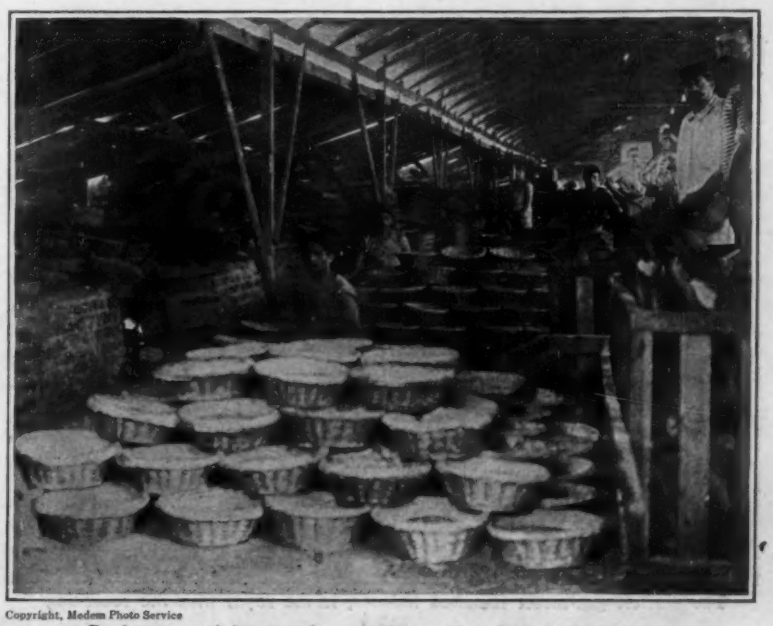
Some of the machinery employed in the large bakery of the intrenched camp of Paris

Where the flour and other ingredients are first mixed by machinery



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Baskets containing certain quantities of bread ready for the ovens

The Search for Metals in Germany

Recent German technical papers contain frequent references to the constant search for metals which have become scarce, notably copper and now also aluminum. The mineral resources of Serbia have been studied, and in Bosnia waste heaps of old copper workings are being diligently explored. Reference is made to the mineral possibilities of Bulgaria, and companies have been recently formed to develop the coal beds in the regions adjacent to Sofia. German producers of aluminum have also been compelled to consider the exploitation of bauxite for aluminum in Austrian territory, which the cost of ransport previously made impracticable. Bosn Hersegovina and Dalmatia are said to be especially rich in this commodity.

Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Speed and Safety Combined in a Unicycle

TRAVEL at velocities heretofore mentioned only with bated breath, and in connection with the wildest flights of fancy, is promised for the not far distant future if the ideas of a New York inventor pan out as he hopes. He has built a small working model of a unicycle, carrying a motor and stabilized by a gyroscopic flywheel at either side, and is now at work upon a large machine to carry a man. Basing his calculations upon actual performances of his small model, which is really little but a toy, he asserts that its big brother will be capable of nine miles a minute.

The construction of the unicycle is extremely simple. The central axle, the wire spokes, the two secondary rims and the large central main rim are all bound solidly together to form the general wheel as shown in the illustration. The outer central rim is 20 inches in diameter. The electric motor is suspended below and connected to the central axle by ball bearings, with the shaft of the motor parallel to the central axle. Two large pulleys, one at each end of the motor shaft, are belted to the inner ends of the hubs of the two gyroscopes, thus transferring higher rotary speed from the motor to these two members. The gyroscopes each weigh seven pounds and are 10 inches in diameter. They are mounted on ball bearings upon the central axle. The traction belt passes around a small pulley on the motor shaft and then around a large pulley fastened firmly upon the central axle. It is not operative until firmly tightened by a lever-actuated idler. The machine runs upon the outer central rim.

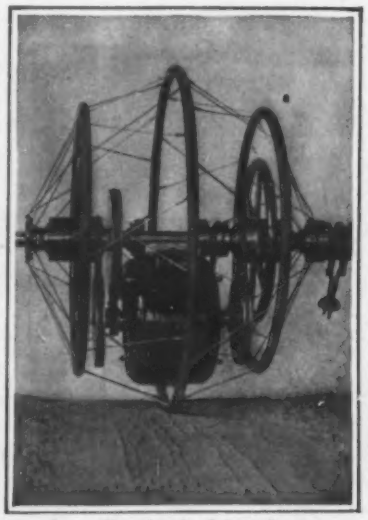
The small model, carrying only a motor, requires current from an external source. This is carried by wire connections through the hollow central axle to the motor. Consequently, the model can only run as far as the wire will permit. In spite of this drawback, the inventor has made very convincing demonstrations with this machine. It may be remarked that the two gyroscopes, the motor and the unicycle all revolve in the same direction. The total weight of the machine is 61 pounds.

To operate the toy unicycle, it is first placed in the position indicated in the illustration. The electric connections are then made and the circuit closed by pressing a button. The motor rapidly attains its standard speed of 1,750 revolutions per minute, while the two gyroscopes reach 3,600 revolutions per minute. The unicycle now possesses all of the activities and peculiar properties, including the characteristic stability, common to all gyroscopes. In fact, it is a perfect gyroscope with the additional advantage of begin driven by its own self-contained motor.

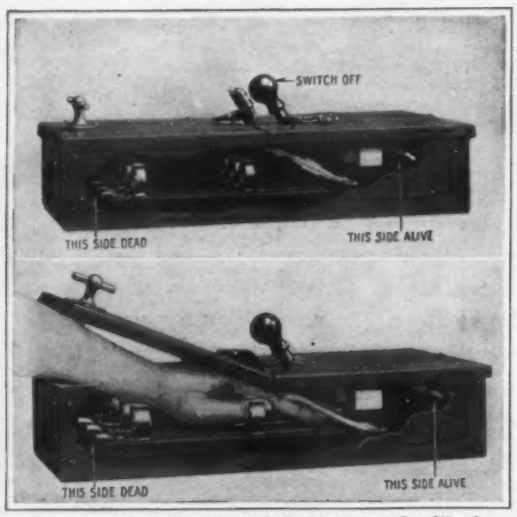
If we now tighten the traction-belt by means of the idler, the motor at once swings forward and upward in the arc of a circle until its weight has been forced so far forward in the wheel that the resulting shift in position of the center of gravity causes the entire unicycle to roll forward. So long as the power then continues to be applied, the motor continues to hold its eccentric position and the unicycle to roll forward. But whether moving or standing, it retains its vertical position with the greatest obstinacy. It stoutly resists all external interference, pushing chairs out of the way or upsetting them as it rolls along over the floor. It requires a very considerable effort to push it over sideways with the hands, and no matter how far over it be forced, it leaps back to its upright position and rolls onward with release of the pressure.

The great potentialities in the unicycle will be understood when it is realized that it performs its functions under extraordinary ratio of weight to power. The motor alone weighs 36 pounds and develops only ¼ horse-power. At this ratio a 125-horse-power engine would weigh 11¼ tons. But the ordinary gasoline engine of this power weighs only 375 pounds, giving the automobile an advantage in weight-to-power ratio, when compared with the unicycle, of 60 to 1. And yet the unicycle runs and runs well.

In building his 14-foot model the inventor plans to overcome this handicap by using the gasoline engine with which the above comparison is made. Once on a par with the automobile in the matter of weight-to-power ratio, the unicycle, it would appear, should make the highest speeds yet attained; by comparison even the fastest racing cars would look as though they were standing still.



A small unicycle driven by an electric motor

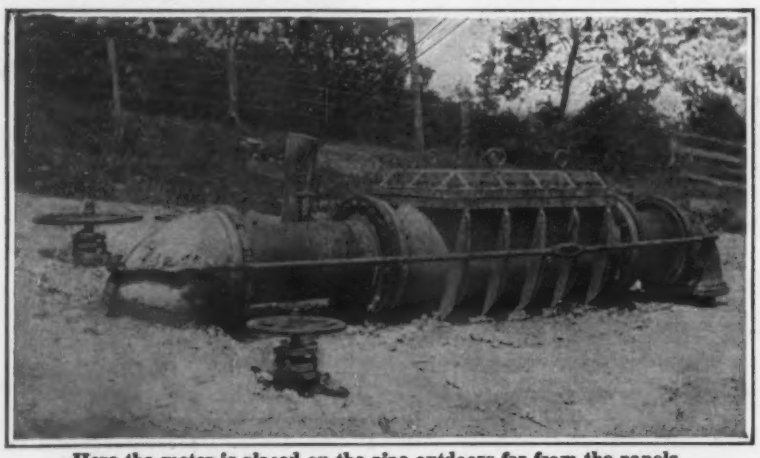


Two views of an electric switch which is "dead" when exposed for fuse renewals

In most of its constructional features this man-carrying unicycle will be analogous to its toy predecessor. An exception to this arises from the necessity of steering. Plainly this cannot be accomplished by forcibly turning the gyroscopes in their paths; these instruments are to be seven feet in diameter and 225 pounds in weight, and it would obviously take many times 125 horse-power to force them out of their planes in this manner. So the inventor plans to mount them upon splined sleeves which will permit them to be shifted bodily to right or left while revolving at full speed; and he counts upon the resulting adjustment of equilibrium to enable the driver of the unicycle to turn the machine at the sharpest angles with absolute ease and certainty.

The driver's seat will be at the lower end of a swinging frame three feet long, the upper end of which will be attached by roller-bearings to the central axle. The engine will be attached to the lower end of a wider swinging frame five feet long, the upper end of which will be attached by roller-bearings to the central axle. These two frames will swing independently of each other.

In conclusion, it may be said that tremendous speeds may be expected from vehicles of the unicycle type. Yet owing to the peculiarities of the gyroscope principles involved in its construction, a degree of safety comparable to present-day vehicles will still be maintained; or it is quite possible that the unicycle will even be a safer and more comfortable vehicle to ride in.



Here the meter is placed on the pipe outdoors far from the panels that give the readings

The electric gas-meter installed indoors, in the room with the recording panel

A Switch Which Is Shock-Proof

THE accompanying illustrations show a unique safety switch, developed at Brooklyn, N. Y., for use in steel mills, factories, mines, and similar industries where most of the workmen have little knowledge of electricity. It is desirable to use switches having no live parts exposed or accessible in the ordinary operation of the switches or when replacing fuses. This is fully accomplished in the presently-described switch, which is intended for use on main circuits or wherever an ordinary knife switch is applied. The switching parts and fuses are enclosed in a steel box, the cover of which is in two parts, one being screwed on to form a permanent covering for that end of the box containing the switch, and the other part being hinged so as to swing back and permit the renewal of fuses, which are located in this portion of the box.

There is an ingenious latching mechanism which makes it impossible to open the cover without first throwing the switch to the "off" position and rendering all fuses and other accessible parts "dead." Thus fuses may be replaced at any time with absolute safety. As long as the door of the case is open, the switch contacts cannot be closed. By using a padlock, the switch handle can be locked in the "off" position, making it impossible for any one to close the switch, except the person holding the key to the padlock.

It is pointed out that by using another padlock, the cover may be locked shut, so that the fuses cannot be tampered with. Either of these padlocks can be used independently of the other, so that the switch cover can be locked shut with the switch either "on" or "off," or the switch can be locked in the "off" position with the cover either locked or open.

Contact is made by means of a laminated spring copper brush, double ended with auxiliary arcing contacts at each end.

It is of interest to note that the outer leaves of the brush are bronze to provide additional spring pressure. The stationary contacts are of hard-drawn copper and are mounted on slate bases, one of which in the fused switch carries one of the fuse clips while the other forms the terminal block for the incoming line and which in the fused switch carries one of the fuse clips while the other forms the terminal block for the incoming line and is mounted under the stationary portion of the cover. The operating mechanism is galvanized steel of the toggle type, and is attached to the under side of the stationary end of the cover.

This mechanism can be easily removed for inspection by removing several screws. In closing, the pressure between the contacts causes the laminations of the brush to spread apart, giving it a wiping or self-cleaning action. The double-ended brushes provide a double break, dividing the arc between the two ends, each of which is provided with a separate arcing tip.

It will be seen that in the closed position the switch is held in positive contact by throwing a toggle over center. A spring provides a quick-break for opening, the mechanism being independent of the operating handle. These switches are for 250 and 600 volts and for either alternating or direct-current service, and built for as high a capacity as 2,000 amperes.

The Electric Gas Meter

GAS is bought and sold in what amounts to standard units of mass; but it has always been necessary to define these units in terms of volume at some standard temperature and pressure. This necessity arose from the fact that there has been no satisfactory means of measuring gas flow except volumetrically, while at the same time variation of temperature and pressure has such a heavy effect upon gas that in anything except the sketchiest kind of an approximation it cannot be ignored.

When gas was first used, it was all right to measure it by what we may call the bucketful method; but with the advent of high pressure mains, the bucketful, a thousand cubic feet, ceases to have definite meaning. Various schemes have been devised to compensate between changing pressures and temperatures as they affected the bulk of the gas, but the underlying idea was always to provide some means of reduction to

(Continued on page 424)

"The Right Timken or None"

A Fundamental Policy of Timken Engineering

To the owner of a tractor, truck or motor car, one Timken Bearing looks very much like another, except in size, for all have the same basic principles of design.

Furthermore all Timken Bearings are of absolutely the same quality, made of the same Timken-made steel, machined, carbonized, heat treated, ground, inspected, tested, and assembled in exactly the same way.

Yet there is a sufficient difference between the bearings on the front axle spindle of your car and the ones at the corresponding point in any other model—even of the same make—*to receive careful study by the best engineering brains Timken can devote to it.*

Past experience, of course, makes each new installation easier, and the difference between two vehicles is sometimes very slight.

But the all-important fact remains that Timken *takes nothing for granted.*

It may be only a little variation in the taper or length of a roller, in the thickness of a cone or a cup, but Timken engineering insists that there can be only one correct Timken Bearing—out of all possible variations—for any particular place in any particular make and model of tractor, truck or motor car.

Therefore every detail in the specifications which can affect the operation of the bearings is given thorough consideration by Timken engineers and discussed in conference with the engineers of the car-builder, axle-builder, or transmission-builder, as the case may be.

These progressive manufacturers not only welcome, but urgently request this co-operation, because they realize how valuable to their customers is the highly specialized experience of Timken engineers, in working out thousands of bearing installations in every past and present type and size of automotive vehicle.

However, if some one manufacturer should prove the rare exception and insist on bearings not suited to his car, because of price or any other consideration, Timken will, as has been the case on past occasions, pass up this business, whatever it might mean in profit.

Timken engineering goes beyond the point of insisting on the proper bearings. It also insists on correct mounting of those bearings.

For the design and construction of the supporting parts, the accuracy with which a cup is pressed into a hub or a cone fitted upon a shaft may affect the future satisfaction of the owner.

The remarkable record of Timken Bearings in service is due to three equally important factors:

1. Fundamentally correct principles of design, applicable to any installation in any type of motor vehicle.

2. Adequate manufacturing experience and equipment, even to the making of the steel itself.

3. Insistence upon proper selection and correct mounting of the one proper bearing for every installation.

THE TIMKEN ROLLER BEARING COMPANY
Canton, Ohio

TIMKEN BEARINGS
FOR MOTOR CAR, TRUCK & TRACTOR

RECENTLY PATENTED INVENTIONS

Pertaining to Aviation

AEROPLANE.—A. ROMUALDI, 280 Fourth St., Jersey City, N. J. This invention relates to a type of aeroplane which derives sustentation from the combined pressures of the fluid it moves through, and by mechanical or other activity of the surfaces presented to the fluid. Among the objects are to enable the flying machine to leave the ground after a short run, and to gradually land with propelling mechanism shut down, and to obtain lifting efficiency independent of the propelling apparatus.

STABILIZER.—R. MCMYERS, 684 Main St., Bridgeport, Conn. The invention relates to a stabilizer for aeroplanes, hydroplanes, and other air and water craft, the prime object of the invention is to provide a stabilizing means involving a gyroscope and means to shift the center of gravity of the vessel by displacing a portion of the mass thereof through the medium of the gyroscopic action upon a laterial tilting of the craft whereby to maintain stability. Another object is to mount the gyroscope and its appurtenances in a manner for facilitating and making effective the actuating function of the gyroscope on stabilizing means.

Electrical Devices

TRANSMITTER.—C. A. REIFEL, 268 W. 138th St., New York, N. Y. The invention relates to sound transmitters of the microphone type especially adapted for use in audiphones and similar instruments. The general object of the invention is to provide a transmitter whereby the sensitiveness is increased and sounds transmitted with fullness and loudness of natural tone while the transmitter is of minimum size.

ELECTRICAL DISTRIBUTING SYSTEM.—V. MARTINETTO, Turin, Italy. This invention relates to the distribution of electric power in the form of alternating current. It is particularly adapted for use where power is transmitted through long feeders, or produced by some delicate kind of machinery, the transmission being in these cases liable to frequent interruption. It provides a partial or total working reserve which is instantly available should a sudden failure in the transmission of the power from the main source take place.

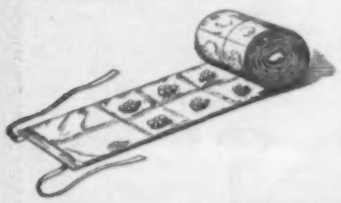
MISFIRING TESTING DEVICE FOR MULTIPLE CYLINDER ENGINES.—M. B. THURBER, Tecumseh, Neb. This invention relates to a testing device for ascertaining which cylinder or cylinders of a multiple cylinder engine is or are misfiring. The testing tool is adapted to be applied to the spark plugs of a multiple cylinder engine and normally disconnected therefrom, the tool comprises a plurality of flexible conductors a handle in which all the conductors are anchored and electrically connected together, and attacking clips on the outer extremities of the conductors.

TELEPHONE SIGNAL RELAY.—E. L. BUKER, Butte, Mont. An object of this invention is to provide a relay which will close a local circuit in which may be installed any suitable audible signaling device, which may be heard above the noise of the locality in which it is positioned. A further object is to provide a relay which is suitable for high tension lines, being composed of parts that are so wide insulated that they will stand high voltages.

TIE CLAMP FOR INSULATORS.—T. R. MAUSEN, 1264 S. St. Bernard St., Philadelphia, Pa. The invention has particular reference to means for easily and securely clamping a high voltage wire to a support. Among the objects of the invention is to provide a clamp comprising relatively stationary and movable jaws for gripping and holding a wire, means being provided to cause one of the jaws to move bodily with respect to the other in both the clamping and unclamping action, and to provide for manipulation by the operator from a distance, as through the use of a pole or the like.

Of Interest to Farmers

SEED TESTER.—A. F. ESSLINGER, 314 No. Park Blvd., Ypsilanti, Mich. The object of the invention is to provide a simple, and inexpensive contrivance for testing seeds. The tester comprises an envelope formed by folding longitudinally the outer member and stitching it at one of the edges, this envelope infolds a pad which absorbs and retains moisture for a period sufficient to cause germination of the seeds. The envelope is stiched longitudinally and transversely, to form sections each of which is numbered for identification purposes.



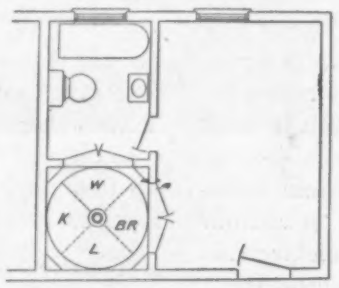
SHOWING MANNER IN WHICH SEEDS ARE ENCLOSED IN TESTER

TOBACCO SPEARER.—H. M. BOWMAN and F. J. SCHAFFER, care of Pioneer Pole and Shaft Co., Memphis, Tenn. The object of this invention is to provide a device which may be employed for spearing tobacco when harvesting the same, the spearer having two pairs of resilient arms, one pair extending within the other, the terminals of each pair of arms converging to a spear which is detachably mounted on a lath held in place on the frame of the device until the desired amount of tobacco is hung on the lath when it may be readily removed from the frame.

WEED CUTTER.—K. KLAFFENT, 3120 Montana St., El Paso, Texas. An object of the invention is to provide a simple light and inexpensive tool which can be handled easily by women working in gardens and fields, particularly for cutting sand burs and cockle burs. The tool is in the shape of a T, the stem of which is tubular and which has a blade opposite the stem merging with the shoulders of the T, the blade having a V notch forming two teeth extending forwardly for cutting the weeds under ground.

Of General Interest

REVOLVING PLATFORM FOR APARTMENT FURNITURE.—P. L. CIMINI. The invention relates to a space saving device for small apartments, forming part of the rooms, and so arranged that a room may be easily transformed, into a living room with library, sleeping room-wardrobe, or kitchenette adjoining, as occasion



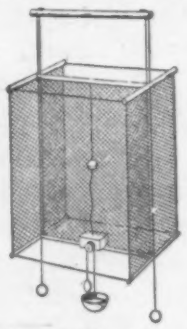
PLAN OF AN APARTMENT PROVIDED WITH THE INVENTION

may require. The structure comprises a revoluble platform, a tubular column, housing a standpipe, the platform being subdivided into a plurality of compartments, the standpipe having a revoluble section, a drain pipe and water supply pipe, and motion transmission means on the platform.

WORK TABLE.—J. BUCHHEIT, 269 Powers St., Brooklyn, N. Y. The invention relates to work tables such as are adapted especially for the wrapping of heavy bundles, boxes, packages, or the like, and delivering the same therefrom to a truck or other mechanical carrier. More definately stated among the objects is to provide a work table designed particularly for wrapping of large and heavy bundles of printed or unprinted sheets of paper, although the field of usefulness is not necessarily limited in this respect.

BEVERAGE SERVER.—J. H. MALLON, 851 Boardwalk, Atlantic City, N. J. The object of the invention is to provide a server having a bell shaped cap over a tank, the tank having a small opening in its top which is normally closed by a lid having a knob by means of which the lid may be conveniently raised from the bell shaped cap and which serves to complete the resemblance of the cap to a bell. The tank is of the kind usually used for ice cream, orangeade or other beverages.

SUBMARINE DESTROYING TRAP.—L. D'AMICO, 1078 Southern Blvd, Bronx, N. Y. This invention relates to a trap which embodies a submerged net with which submarines or surface floating craft may become enmeshed. A specific object is to provide an arrangement of vertically disposed nets carried by a buoyant structure fully



A PERSPECTIVE VIEW OF THE TRAP

or partially submerged, the nets being so arranged that a submarine will become enmeshed irrespective of the angle of approach, and by reason of the trap being caught on the submarine, a switch is closed to set off a mine carried by the trap.

TOY AND PROCESS OF MANUFACTURING THE SAME.—S. L. MCINTIRE, 436 Cherry St., Springfield, Mo. The invention has for its object to provide a toy consisting of a plurality of cardboard blocks on which characters may be printed, the blocks being united by one or more pieces of tape to permit them to change their positions relatively to each other, when one of the end blocks is manipulated.

IMITATION ARTICLE.—C. JAEGER, M. J. ROTH, and C. H. BOEKER, care of The Plastic Art Novelty and Specialty Co., 1495 Third Ave., New York, N. Y. The invention has particular reference to display cigars. Cigars when placed on exhibition, subjected to light and heat of the sun soon deteriorate in value. The object of this invention is to provide means whereby loss by deterioration may be avoided at slight cost, by faithfully reproducing the form, size, color, manner of assembling or bunching, labeling and any other characteristic of the make, so that the imitation devices in any number may be employed.

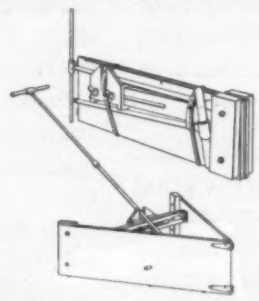
SPRAYING NOZZLE.—B. E. MILLARD and F. B. TAYLOR, San Diego, Cal. The invention has for its object to provide a nozzle which will break up the water into fine particles and deliver it in a widespread spray. The device comprises a dish having a substantially rectangular opening extending from one face thereof to the other, and arranged diametrically thereof, the opening having its end walls inclined and converging toward the outer face of the dish and having its side walls approximately parallel, and means for connecting the dish to the end of a pipe.

ROOF COVERING.—E. FLAGG, 109 Broad St., New York, N. Y. The invention relates to roof coverings of the waterproof type known on the market as "paroid," "everlastic," "rubberoid," etc. The invention is intended to obviate the buckling caused by the action of the weather when such roofs are put down in the usual way. The method comprises the overlaying narrow strips, running transversely of the slope, means securing the underlaying edges of the strips, and overlapping angle sections at the ends of the strips.

SEAT ATTACHING DEVICE.—H. KAMRASS, 318 Seventh Ave., New York, N. Y. The object of the invention is to provide an attaching device more especially designed for securely and quickly attaching upholstered or plain seats to the seat frame of a chair without the aid of skilled labor. Another object is to enable the owner of a chair to remove a broken or injured seat and replace it by a new one.

ENVELOPE.—J. MOORE, Co. C, National Soldiers Home, Dayton, Ohio. The invention relates to an envelope of the safety type which is characterized by the provision of tongues extending from the covering flap and for which slots are provided in the other flaps of the envelope, the tongues being provided with adhesive adapted to engage the side flaps of the envelope and retain the same in position when the envelope is sealed.

SNOW PLOW.—V. W. MASON, Jr., 240 Fairfield Ave., Bridgeport, Conn. The object of the invention is to provide a simple, inexpensive, and collapsible plow, which when folded may be easily carried



THE DEVICE FOLDED, AND OPEN FOR USE

from place to place. A further object is to provide a plow of the manual type, so constructed and counterbalanced that its pushing and pulling steering handle, relatively fulcrumed exerts a varying downward pressure according to the depth and resistence of the snow. The plow can be adjusted to clear a path from 28 to 36 inches in width.

SLEEPING EYES MOUNTING FOR DOLLS.—D. A. ST. GERMAIN, 62 W. 14th St., New York, N. Y. A specific object of the invention is to provide a mounting having adjustable means whereby the proper set of the eye with respect to the eye socket of the head can be easily and quickly obtained, the mounting including a yielding supporting member which permits the eyes to yield inwardly without any injury to the mounting, and capable of automatically restoring the eyes to normal position.

PROCESS FOR PRODUCING PRINTING PLATES.—L. J. HARTLIN, 218 William St., New York, N. Y. The process relates to the production of printing plates used for printing different colors, the object is to devise a method whereby such plates may be produced without the need of skilled labor and at comparatively little cost. The process is particularly suitable for printing exact reproductions of designs of linoleums, oil cloth, and the like.

AMALGAMATOR.—J. HUTCHINGS, 2105 Millard Ave., Chicago, Ill. The object of the invention is to provide an amalgamator in which the auriferous bearing material is forced through a layer of mercury with a decreasing speed. The invention is characterized by a mercury chamber

A LONGITUDINAL SECTION OF THE INVENTION

of varying depths and of a cross section increasing toward the outlet, so as to reduce the speed of flow, and means at the chamber's inlet for agitating and propelling the pulp, there is a stepped cover for the chamber which carries value recovering plates.

SOUND DEVICE FOR DOLLS.—B. E. LLOYD, 309 Jane St., West Hoboken, N. J. The invention relates to voices for dolls and figure toys, it deals more particularly with bellows construction. A specific object is to provide a simple and effective voice for toys, embodying a weighted head on one end of the bellows whereby the turning of the bellows upside down and back again will automatically expand and contract the bellows and cause a sound to be produced by the passage of air through a reed or equivalent device.

MOP.—D. KENNER, 426 Camp St., New Orleans, La. Among the objects of the invention is to provide a type of mop that may be effectively cleansed and wrung by hand operation, but without requiring the wetting of the operator's hands. The device comprises a handle having a longitudinal bore at one end and a

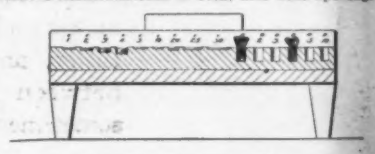
SHOWING A VERTICAL SECTION

plurality of lateral holes leading outward from the bore, an open mesh sleeve surrounding the part of the handle having the bore and holes, a textile mop secured to the end of the handle, a hand grip movably mounted upon the sleeve, and means securing the other end of the head and the hand grip.

MEANS OF HANDLING NATURAL CARBONATED WATER.—C. G. ANTHONY, 1566 E. Washington St., Los Angeles, Cal. Among the objects of the invention is to provide means whereby, when the water supply is running light in carbon dioxide, such water solutions are treated to separate the gas from the water, the gas being stored temporarily in a suitable gasometer whence it is forced into the mineral water storage reservoir to strengthen the carbonation so as to maintain the degree of carbonation to a certain standard.

BOMB.—E. R. SUTCH, 439 Lemont St., Roxborough, Philadelphia, Pa. The invention relates to weapons of warfare designed to be dropped from airships. Among the objects are to provide means for maintaining the device in erect position in its descent, for holding the same in vertical position after having reached the earth, for radiating a multitude of bullets in a horizontal plane after the device has reached the earth, and for revolving the cartridge carrying member of the device during the firing.

TABLE.—J. P. HINES, 312 Eltwein St., Bethlehem, Pa. This invention has for its object to provide a table especially adapted for cashier use for making change quickly, the table is provided with grooves or passages for receiving various denominations of coin, and with openings



A SECTION OF THE TABLE

for receiving various denominations of bills. In use, the passages are filled with the coin properly arranged to quickly make change, the passage being designated by the legend 1c., 5c., etc., the passages are just deep enough, and wide enough, to hold the coins approximately flush with the top of the block.

FORMALDEHYDE COMPOSITION AND THE PREPARATION THEREOF.—D. M. MCCARTHY, 359 Rugby Rd., Brooklyn, N. Y. This invention relates to a composition of matter for sterilizing, disinfecting, and medical purposes. An object of the invention is to provide a homogenous, consistent mass including formaldehyde adapted to emanate from the mass to sterilize or disinfect the surrounding atmosphere. The composition consists of a mixture of formaldehyde and agar-agar, which is not rendered horny by the formaldehyde.

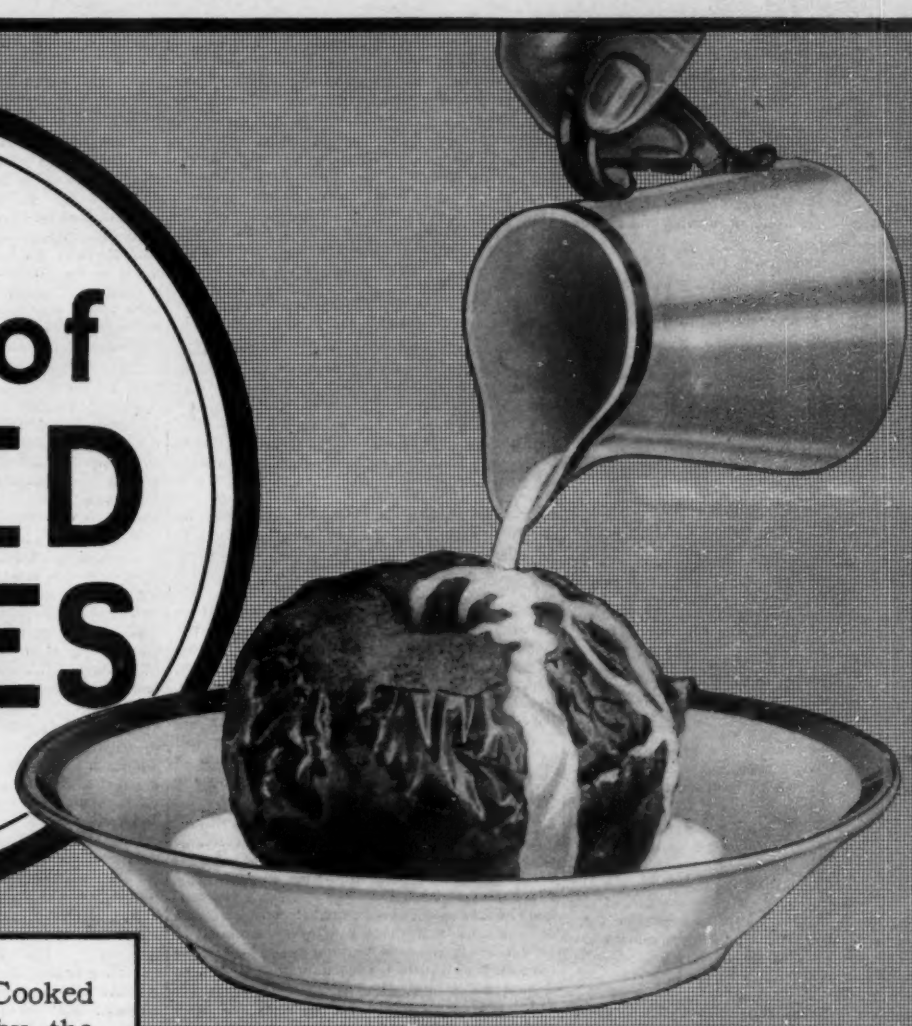
APPARATUS FOR CLEANING ERASERS.—J. A. JONES, care of Northern Realty Co., Logansport, Ind. The invention relates to an apparatus whereby to clean blackboard erasers. The general object is to provide an apparatus equipped with feed means to engage the eraser as it enters the apparatus, to provide an effective means to successively beat and brush the eraser as it is advanced, and to provide for exhausting the dust by means of a fan assembled in compact form.

ICE CREEPER.—A. SCHEMEL, Yonkers, N. Y. One of the principal objects of this invention is to provide a spurred plate removably attached to the means provided for holding it in service on the shoe. The creeper comprises a keeper plate held in service relation to the shoe, under the instep, by a strap, the spur plate being removably attached to the keeper plate, means being provided for locking the spur plate to the keeper plate.

SCALE.—A. B. CLARDY, 356 So. Broad St., Mobile, Ala. The invention relates to scales particularly adaptable for the use of sheet metal workers. An object is to provide a straight edge ruler having various scales thereon whereby the various computations necessary in the execution of work in sheet metal is considerably simplified and carried out more rapidly.

(Continued on page 420)

Use plenty of BAKED APPLES



USE plenty of baked apples. Cooked fruits are recommended by the Food Administration.

How baking does bring out the delicious flavor in a baked apple—it's improved 100 per cent over the raw apple.

We use the same idea to improve the flavor of tobacco—offer it to you toasted instead of raw. Try Lucky Strike Cigarette—it's toasted.

LUCKY STRIKE CIGARETTE

Open your package this way

It's toasted

Save the tin-foil from Lucky Strike Cigarettes and give it to the Red Cross

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RECENTLY PATENTED INVENTIONS

(Continued from page 418)

MOUTHPIECE GUARD FOR SMOKING PIPES.—S. WALKER, 476 Herald Ave., Richmond Hill, L. I., N. Y. The objects of this invention are to enable a smoker to protect himself against contamination or infection when using a pipe; to avoid the contact of the tongue with bitter portions of the mouthpiece when smoking, to furnish single-use covers for mouthpieces, and to simplify the operation of installing in service the guards mentioned.

SHOE RETAINER.—V. BENEDETTI, Abbott Boulevard, Palisade, N. J. Among the principal objects of the invention are to provide independent means for retaining the heel of a skate shoe firmly in service position on the foot. The device comprises a supporting section with openings to receive the ankle joints, the section partially covering the counter and rear of the shoe, strap ends for encircling the ankle, and means extending below the arch for holding the retainer in place.

REFRIGERATING APPARATUS.—S. C. CANTI, Washington, N. C. The invention relates more particularly to a cover for freezing tanks. An object is to provide a cover which is made in sections to cover individual rows of ice cans, so that the cover section of one row may be removed without disturbing the remaining rows. Another object is to provide a cover which has a central guide or division strip, the object being to prevent displacement and over lapping of the cover sections.

COLORATION METHOD.—B. D. AVIS, 404 Union Bank Bldg., Clarksburg, W. Va. The invention relates to a method in which a double mercuric salt is precipitated on a surface and renders the surface iridescent, it consists in forming an ammonical solution of a double salt of mercury and ammonium, the solution is precipitated on the surface by the evaporation of the ammonia.

EYEGLASS CASE.—R. A. GOEKEL and W. N. LURCOTT, care of Straschow and Kubica, 58 W. 15th St., New York, N. Y. Among the principal objects of the invention are to facilitate the wiping of the lenses of eyeglasses while in the carrying case. The case is of conventional form also of usual construction. The retainers are provided with pads in paired relation being so arranged that when the cover is closed the pads are juxtaposed, the pads are constructed of material having a resilient body so that they normally press on the lenses, the construction provides for moving the frame and lenses. This motion results in polishing the lenses when held between the pads.

UMBRELLA RING AND MARKER.—J. H. GILROY, care of Mr. Brady, 130 So. 8th St., Newark, N. J. This invention relates to an attachment for an umbrella for the purpose of holding the tips of the ribs close to the handle rod when the umbrella is closed, and for the purpose of designating the owner of the umbrella. The invention has for its general object to provide a device so designed that when once applied to an umbrella it cannot be detached, and consequently the owner's name will always be carried on the umbrella.

CARD FOR INDEXES.—J. A. BEST, Augusta, Ga. The object of the present invention is the provision of a card for general indexing, adaptable as either a sub-index card or a record card, and whereby a system indexed by means of the usual tabbed index or guide cards, may be expanded and further indexed to two additional letters throughout, either as to letter of surnames, initials, or the like.

BROILER.—A. BOUCHERIX, care of E. H. BROWN, St. Albans, L. I., N. Y. An object of the invention is to provide a simple and inexpensive contrivance which permits the broiling of meats on a furnace without the discomfort generally caused by the fumes and odors resulting from the open broiling of meats. Another object is to provide a contrivance which will broil more quickly and without the necessity of lowering the fire.

OPENER FOR GLASS TOPPED JARS.—DE WITT C. RELYEA, Coscob, Conn. The prime object of the invention is to provide means for quickly and safely removing the glass tops of a vacuum sealed fruit jar or its equivalent. With this device it is impossible to either crush, break or chip any part of the jar or cover, yet with the application of very little force, a cap held by a high degree of vacuum may be readily lifted.

AIR MOISTENING AND COOLING DEVICE.—S. SHOESMITH, 85 Hunter St., E. Hamilton, Ont., Canada. Among the objects of the invention is to provide an apparatus adapted to be located in a window frame or opening after either or both of the usual sashes are removed, the apparatus including means for causing a spray or mist from water, either in a natural state or charged with sea salt or chemicals, according to the requirements of a patient or other people within the building as prescribed by a physician.

FLUID FLOW CONTROLLING VALVE.—C. H. SCHMALZ, Billings, Mont. An object of the invention is to provide a valve so constructed that it is impossible for sand, pebbles, gravel and the like, or other extraneous matter to settle in pockets in the casing, and so prevent proper operation of the valve, in whatever position it may be installed. A still further object is to provide a valve in which the movable portion is operated in an easy manner.

LEFT OVER ICE BOX FILE.—E. I. LUDWIG, Box 191, Boonton, N. J. The invention has for its general objects to provide an arrangement of receptacles whereby foods can be compactly stored in a sanitary and effective manner, the receptacles being so constructed that one can fit in another so that covers are despensed with except for the topmost, the receptacles are so shaped that it is impossible to place groups of them so close together as to interfere with the circulation of the air.

CARTRIDGE FOR CLEANING WELL STRAINERS.—V. H. NICKERSON, Cotuit, Mass. The invention has for its object a device which may be lowered in a driven well point or strainer while in the ground and be exploded to clean the strainer, which may become clogged while in use. The cartridge may be lowered into the well by means of a wire, and the explosive fired by passing a current through the wire which will jump the spark gap to the tube; the tube may be removed from the well by drawing the wire up.

CLEANER ATTACHMENT FOR SILK MACHINES.—A. BAKER, care of Harbred Silk Co., Box 21, Coudersport, Pa. The objects of this invention are to provide a cleaner attachment, adapted to be secured to the cross-piece running through the silk throwing machine below the upper bobbins, and provided with combs disposed horizontally, transverse to the path of movement of the threads, and to provide a cleaner attachment having a comb so formed as to avoid all danger of the breaking of the silk threads except when a bunch of waste or the like is twisted fast in the thread.

RIFLE BARREL.—B. HOLTER, Whitefish, Montana. The object of the invention is to provide a rifle barrel arranged to reduce the mechanical friction between the wall of the bore of the barrel and the projectile to a minimum, thus increasing the velocity of the projectile. Another object is to provide a complete occlusion thus preserving the form and smoothness of the wall of the bore, to produce this result, the wall of the bore is formed of lands in the form of chords of a circle alternating with lands in the form of arcs of the same circle.

SOLAR TRANSIT.—H. N. RAYMOND, Winthrop, Washington. The invention relates to solar transits of the solar telescope and reflector type, its object is to provide an instrument which is very compact, well balanced, exceedingly accurate, and easy to adjust. To accomplish the result use is made of a main axle mounted to turn in standards, a latitude arc carrying a solar telescope, a transit telescope mounted to turn at one end of the main axle and on the other end on a sleeve adjustably held on the main axle.

STRAINER.—M. T. SAGE, 780 Union St., Brooklyn, N. Y. The object of the invention is to provide a strainer suitable for light liquid hydrocarbons which will prevent any liquid or gas from escaping from the strainer. The invention is characterized by a casing having an inlet above an outlet, between which a straining surface is interposed, the straining surface being removable through the top of the casing, whereat a ground joint is provided to insure against leakage.

Hardware and Tools

PIPE AND NUT WRENCH.—H. F. HOFFMAN, 1840 Richmond Turnpike, Staten Island, N. Y. The invention relates to a quick adjustment for wrenches. Among the objects of the invention is to provide a new form of locking dog for the adjustable jaw, to simplify the construction and increase the strength and reliability of the pivoted yoke or that portion which carries the dog.

PLANE.—W. CLARK, 126 Hamilton St., Long Island City, N. Y. The invention relates to wood working implements. An object is to provide a plane having a central guide for a central blade, a pair of side guides for cutting tools of different kinds, a front guide and offset portions on the sides for allowing the side implements to act as beading tools, grooving tools, and the like, more specifically the object is to provide a single skeleton and a plurality of tools and clamps associated therewith.

VALVE GRINDER.—C. L. LATIMER, care of J. A. Latimer, Williston, S. C. The invention relates to grinding tools more particularly to mechanism for grinding a valve mechanically in place of manually. An object is to provide a compact mechanical drive which can be easily accommodated on the head of a cylinder of an internal-combustion engine for engaging the valve to be ground without interference with the other parts located on the head.

KEY GAGE.—B. LUBIE, 172 E. 94th St., New York, N. Y. The object of this invention is to provide a key gage arranged to permit of quickly and accurately gaging duplicate keys. To produce this result, use is made of a row of adjustable gaging members, a movable key support adapted to support a key having cuttings to be gaged, and a row of setting members bodily movable with the key support and adapted to engage the cuttings and to register with the gaging members.

Heating and Lighting

HEATER.—J. JACUCIS, care of W. E. Roe, 213 Calumet Bldg., East Chicago, Ind. This invention relates particularly to a heater for buildings wherein the usual waste heat from the smoke pipe is utilized in heating one or more rooms. The object is to provide a heater which is adapted to receive the smoke and gases from a stove and to cause the heat therein to be radiated over a predetermined surface. A further object is to provide a heater wherein smoke and hot gases from a kitchen range may be caused to warm the adjacent room.

STOVE.—E. C. COLE, Chicago, Ill. The invention relates to sheet-metal stoves for heating rooms or apartments. The body of the stove is made in practically two duplicate parts, the same being tapered from the horizontal middle upwards and downwards, so that when detached they are adapted to be nested for storage or transportation. The invention includes a casting which conceals and protects the screw-bolt fastening by which the body parts are held together.

Machines and Mechanical Devices

MACHINE FOR RENDERING FUR SKINS PLIABLE.—R. E. ALFI, 36 Brazil St., Richmond Hill, L. I., N. Y. The invention relates to the treatment of fur skins while in the raw state for rendering them pliable to allow of proper dressing and dyeing. To accomplish this result, use is made of revoluable rubbing members having a common axis and yielding toward and from each other, the opposite faces of the kneading members having projecting kneading elements, spaced apart to receive the fur skin.

SHIP CALKING MACHINE.—M. B. TERLESKY, Portland, Ore. The invention has for its object to provide a machine of the character specified capable of being moved along the seam between two boards and having means for constraining the same to follow the seam, and having power operated calking chisels for calking the seams. The speed of the feed may be controlled, and the chisel omitted if desired.

SUGAR MAKING APPARATUS.—E. H. MAN, Kahuku Mill, Oahu, Territory of Hawaii. This invention relates more especially to devices for crushing the cane to express the juice. An object is to provide crushing rollers arranged in pairs, one of the rollers having a series of knobs or lugs arranged to enter corresponding sockets in the companion roller to secure the maximum amount of juice in the crushing operation.

LIQUID LEVEL GAGE.—L. G. LECOMPTE, McKittrick, Cal. The object of the invention is to provide an automatic gage for measuring the liquids in tanks, vats, or other receptacles, or for measuring the rise and fall of lakes, rivers and other bodies of water, and transmitting and registering the results of such measurements at distant points. The registering mechanism consists of a stationary dial and pointer, by which the rise or fall may be readily computed by reference to the normal level.

FLESHING AND FUR DRESSING MACHINE.—A. BAUSER, 265 Stanhope St., Brooklyn, N. Y. The object of the invention is to provide a fleshing and fur dressing machine which is constructed of few parts, which may be readily adjusted and repaired. Another object is to provide a circular knife, the circular blade of which may be conveniently removed for sharpening purposes and may be advanced relatively to the body of the knife as desired.

AIR AND GAS PUMP.—R. A. BEMIS, care of Medical Corps, Carlstrom Field, Co. I, Arcadia, Fla. The invention relates particularly to rotary pumps. Among the objects is to provide a casing having internal walls consisting of regular geometric forms, forms of revolution, and with a rotary piston in the casing having a plurality of blades arranged in pairs and so pivoted on axes radial with respect to the center of the piston to swing toward and from each other and wipe against the side walls of the casing as well as filling the entire space radially between the center of the casing and the peripheral wall.

APPLE QUARTERING MACHINE.—C. KIRINO, care of Tomahi & Co., P. O. Box 418, Ogden, Utah. The invention relates to a machine for cutting into quarters or other sizes pared and cored apples for canning. A more specific object is the provision of a conveying means for the peeled and cored apples, in combination with a series of traveling tanks so timed in relation to the apple containing means that the apples will dip into the tanks, and from the tanks are conveyed to suitable cutting means whereby they are quarterd by cuts coincident with the axis of the core passage.

Medical Devices

BREAST PUMP.—O. O. R. SCHWIDETSKY, Hasbrouck Heights, N. J. The object of the invention is to provide a breast pump arranged to prevent the milk drawn from the breast from passing into the rubber bulb thus obviating cleaning the same. Another object is to provide the body of the pump at one end with a flaring month and at the other end with a flaring neck to allow convenient cleaning of the body and to permit of readily removing the bulb whenever it is desired to clean the body. Another object is to permit of feeding the milk received by the breast pump direct from the pump to the infant.

DENTAL FLOSS HOLDER AND MANIPULATOR.—E. SIEVERS, New York, N. Y. The invention relates generally to implements for holding and manipulating dental floss, the object being to provide a sanitary and efficient holder and manipulator which may be inserted in the oral cavity and by means of which the floss may be projected and quickly adjusted between the teeth; the instrument is not limited to dental use.

SURGICAL INSTRUMENT.—J. T. LANDIS, 1227 Broadway, Nashville, Tenn. The object of this invention is to provide a device for the treatment of hemorrhoids wherein a ball is provided to be inserted in the rectum, and having a neck adapted to extend through the sphincter muscle and connected to a base shaped to fit the parts, the ball being bored to permit the passage of a medicament, a container for the medicament being detachably connected with the base.

Musical Devices

PLAYER PIANO.—E. A. TAPPE, care of Philip C. Peck, 27 Cedar St., New York, N. Y. The invention relates to player pianos in which the hammers are normally held in reduced or half-stroke position by the use of a hammer rail made in movable sections controlled by pneumatic actuating devices for moving any one of the hammer rail sections into position for holding the corresponding hammer in full stroke position. An object is to provide a device which can be readily applied to a grand or upright piano player as now generally constructed.

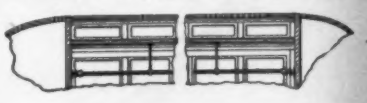
Prime Movers and Their Accessories

INTERNAL COMBUSTION ENGINE.—W. BIBBEE, Spokane, Wash. This invention has for its object to provide mechanism adapted to be arranged between the carbureter and the air inlet, for straining and purifying air before it enters the carbureter. In this device the air is passed through a wire mesh screen and through a screen of falling water which covers the outer face of the screen, all sediment and impurities are strained out, thus the wear and friction caused by dust is eliminated.

DEVICE FOR OILING THE INNER SURFACES OF THE COMBUSTION CHAMBER OF EXPLOSION MOTORS.—K. I. SMIDT, Holte, near Copenhagen, Denmark. The invention refers to devices for automatically oiling the inner surfaces of the combustion chamber and at the same time supplying auxiliary air for the gas mixture. An object is to provide an automatic means for oiling these surfaces by oil saturated air from the crank chamber, the air is led to the main gas pipe where it is mixed up with the gas, which at the same time becomes more explosible by the added auxiliary air.

Railways and Their Accessories

HANDHOLD FOR CARS.—W. LINN, 1115 No. American Bldg., Philadelphia, Pa. This invention relates to handholds for street or other cars; its object is to provide a form of hold, with simple and effective means for checking or retarding the swinging of the hanger strap, to



A SECTION OF CAR SHOWING THE APPLICATION OF INVENTION

prevent its striking the hats of sitting passengers. A further object is to provide a form of handhold which is sanitary and which can be readily wiped off when soiled, hung high enough to allow headroom for passengers in rising from their seats, but within comfortable reaching distance of the standing passenger.

Pertaining to Vehicles

SHOCK ABSORBING ARRANGEMENT FOR VEHICLES.—J. P. SINSOU, Levallois, Parret, France. The object of this invention is to provide a shock absorber of the hydropneumatic type. For this purpose the liquid contained in the shock absorber constitutes only a hydraulic joint or seal for the air inclosed in the compression chamber. The breaking of the apparatus is obtained by air, which is drawn into an auxiliary chamber provided for this purpose, when the piston moves under the action of a shock and which is then compressed by the piston on its return movement.

TIRE GAGE ATTACHMENT.—G. B. MULLEN, Bell Ave., near Broadway, Bayside, L. I., N. Y. The invention has for its objects to provide a simple and inexpensive attachment so designed that an ordinary pocket gage can be applied to any valve stem in such relation thereto that by pressing the gage against the valve in the stem the pressure of air in the tire can be registered the attachment being removable, together with the gage, whenever it is desired to supply air to the tire.

WINDOW FOR VEHICLE CURTAINS.—P. SCHAFER, 229 N. Poplar St., Seymour, Ind. The invention relates to the construction incident to the mounting of windows in apertures in the curtains of motor vehicles, the object being the provision of a construction of frame which will permit of ready change of the celluloid or other transparent material utilized, and also permit at the same time of a firm uniform connection with the curtain, without danger of tearing or otherwise mutilating the latter

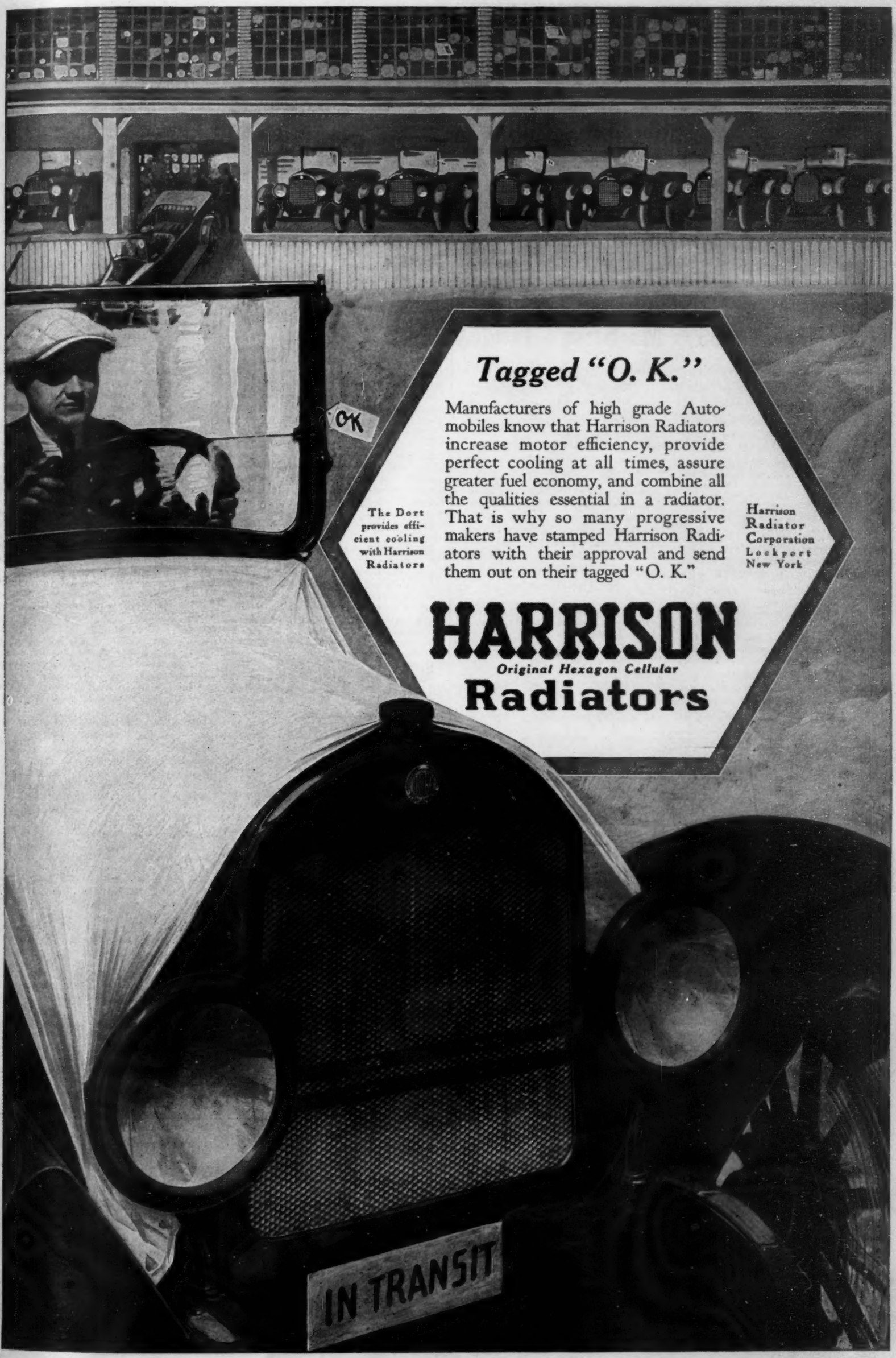
VEHICLE SPRING SUSPENSION.—J. R. POPE, 527 Fifth Ave., New York, N. Y. The object of the invention is to relieve the frame of an automobile from shocks and prevent side sway by improving the spring-suspension system in use. The invention is characterized by the provision of yielding elements between the front and rear elliptical springs, and the transmission of the deflection of the front spring to the rear spring, or vice versa, thereby synchronizing the relative movement of the frame and spring suspension

PROTECTOR FOR THE TIMERS OF AUTOMOBILE ENGINES.—M. R. BRUGMAN, Windsor, Ohio. The prime object of the invention is to provide a waterproof and oilproof protector attachable to the timer and adjacent wires to prevent short circuiting by the causes referred to. Other objects are to provide a protector which may be readily applied and held in position largely by elements appurtenant to the timer, and to secure the protector that it will not interfere with the movement of the timer casing.

Designs

DESIGN FOR AN AUTOMOBILE RADIATOR.—C. T. SILVER, care of J. M. Lowenstein, 149 Broadway, New York, N. Y. This inventer has obtained patents, on two designs one in the form of a high arch, the other in the form of a medallion.

DESIGN FOR A COMBINED AUTOMOBILE RUNNING BOARD AND FENDER.—C. T SILVER, care of J. M. Lowenstein, 149 Broadway, New York, N. Y. The design covers the top of both front and back wheels, as well as providing a step for entrance to the car.



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If you are an engineer or architect, write us for the Specification for the application of "85% Magnesia," compiled and indorsed by the Mellon Institute of Industrial Research and issued by the Magnesia Association.

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Our Aerial Sausages

(*Continued from page 409*)

nothing to remember, nothing to do, but to get out when the danger is such as to make his hurried departure necessary. Unfortunately, our sporting enemies have been known, time and again, after having set fire to a balloon, to follow the parachuted observer down to earth, firing at him as they go; and more than one who landed safely, as far as the drop was concerned, landed with a Hun bullet in him.

As might be expected, these parachutes are most carefully inspected and most thoroughly tested. It is said that in no tests which we have been able to devise for them have they ever failed, except when frozen. They have been folded up wrong, the ropes tangled, folded up wet, and yet, when tested with sandbags of a weight equal to that of a man, they have invariably opened and brought the bags uninjured to earth. A frozen parachute, however, will not always open; and in such tests, the bags, falling a thousand feet or more, have entered the earth and then burst like an explosive shell.

Parachutes open at from four to five hundred feet from the point of departure. During that first plunge downwards the speed is practically that of an unimpeded falling body. After the parachute opens and the fall is checked the speed will be at about ten to fifteen miles an hour, depending on the weight of the man and the size of the parachute.

It is taught all officers from the very beginning that the only way to use a parachute when the necessity occurs is to use it quickly. A delay of a few seconds may be fatal. When a Boche aviator sets a "khako" on fire, the moment the fabric burns through, the inclosed hydrogen ascends in one puff of flame. There remains the fabric and the valves, the ropes and the cordage, the basket and its ballast. All this, usually burning, drops as fast as a man. If the man doesn't get out of the basket fast, when he sees his balloon is fired, it is probable that he and the wreckage will go down together. Then when his parachute opens, he slows up, but the burning debris does not, and, striking his parachute, will set it afire in turn and one more balloonist will have "gone west" by going down.

When two men are in the balloon, and both jump, they must not jump together or they may foul. Not a hundred days ago a young officer on the front lost his life by sending his companion ahead of him and waiting, watching, a fraction of a second too long before following—the burning fragments of the balloon caught him and ignited his parachute but a hundred or so feet from a safe landing.

Balloon officers are forbidden to practice parachute jumps. There is nothing in the jump which can be learned, nothing to know that will help next time. And there is no use risking a valuable life if there is nothing to be gained. But you will search far and wide for the balloon officer who doesn't want to have the experience—which says much for the very evident safety of the modern military parachute and its certainty of opening and functioning.

The "khaos" are filled, of course, with hydrogen. But in place of the former chemical generator which was for long an integral part of a balloon outfit, cylinders of compressed hydrogen are used, filled at a central station under high compression and shipped to the point of inflation. They are attached to a manifold, into which the released gas rushes by expansion and from this manifold the gas is led through a fabric tube to the balloon. In the accompanying picture of this tube, men are seen straddling it with sand bags and cords—their duty is to choke the pipe on any alarm of fire.

The gas is originally obtained by any one of half a dozen processes—sulphuric acid and iron, electrolysis, caustic soda, or the commercial process known as Messerschmidt, which uses superheated steam. Of these, electrolysis of course gives the purest hydrogen, and has the added advantage of yielding a by-product of oxygen which is useful in another department of aeronautics, the oxygen outfits for high altitude work in airplanes.

The purity of the hydrogen has much to do with the available lifting power of the balloon. Air weighs about seventy-five pounds per thousand feet and hydrogen about five pounds for the same quantity. A balloon, then, with a capacity of 40,000 cubic feet will have a lifting power of 2,800 pounds, if the hydrogen is pure.

The "khako" balloon is in all respects to be considered a free balloon if it breaks away. It is provided with a valve—in the nose of the balloon rather than its top—and the familiar rip panel as well. It has also a ballonet inside for air inflation to accommodate expansion and contraction and the familiar neck of the spherical free balloon is absent. It is rare indeed, that a "khako" breaks away, for the cable which anchors it is constantly subject to the most searching inspection. Not a foot of it is paid out or hauled in that is not narrowly watched—indeed, the maintenance of the cable in perfect condition is one of the most important duties of the officer supervising the flight from the ground. If, however, a "khako" does break away, the officers aloft are in as much control of the bag as they would be in a regular free balloon flight, having both ballast and valve, and in spite of the bound with which a suddenly freed sausage takes to the upper air, ordinarily have small difficulty in making a safe and speedy landing. And there are always the parachutes.

The training of a "sausage" balloon observer is a combination of balloon, artillery control, map making and observation course. The observation training is intensive and growing in accuracy and magnitude all the time. Things look very different from one altitude than from another, and it requires considerable practice to distinguish accurately. Among other things, the judgment of distance of smoke puffs from a given object is taught, and in the ground training, this is accomplished by a unique little apparatus in which a landscape in miniature is provided, at different points of which small smoke puffs are observed from different distances and altitudes, the students learning thus the rudiments of distance and angle observation.

The balloon companies must know not only how to handle the balloon aloft but must be expert in taking care of it on the ground. In this we have learned much from both French and English. Conditions at the front change too rapidly to permit the erection of balloon sheds except at certain military bases, so the sausage is bedded behind huge wind breaks in the woods, if possible, and most scientifically secured to wire rope anchors. These most unmanageable objects have been so tamed that flights can be made even in high winds, and the sausage so anchored and protected from the weather, even in the open, that no wind storm short of a hurricane could make deflation necessary.

How Allied Propaganda Was Spread Among German Soldiers

(*Continued from page 413*)

lines. Recently the Deputy Commander of the 7th German Army Corps issued a statement saying that Entente progaganda was being dropped not only in the German lines, but among the German people in the interior. "These leaflets," he said, "are mostly dropped over the country, in paper or India-rubber toy-balloons, by means of a mechanical dropping apparatus, and they are further spread by enemy agents. It is emphatically pointed out that it is the patriotic duty of every German in whose hands such leaflets, paper balloons, or India-rubber balloons fall, to deliver them to the nearest police authorities, and to denounce to the police the agents who spread such leaflets." Needless to say, such commands were not often obeyed, especially of late.

The German propaganda behind the Allied lines was poorly conducted, due to a complete failure to understand Entente and American psychology. Our troops were called upon to stop fighting for the usual reasons of all German propagandists. Because of the shifting of our troops from one part of the line to another, German propaganda literature in French often fell among American troops, where it could not be read, and English literature fell among the French.

Canada's New Niagara Development

(*Continued from page 413*)

400 tons and carries 75 tons of ballast, are mounted on four railway tracks 30 feet apart. Cable excavators operated on 80-foot steel towers with an 800-foot span are being used on the river section.

Compressed air stations have been built and from these air is pumped at 125 pounds pressure, in 10-inch mains for three miles in each direction.

The commission in addition to its own railway, electric power and compressed air distributing system has provided waterworks systems for the model villages in which the 3,000 men are housed, and

(*Continued on page 424*)

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Canada's New Niagara Development

(Continued from page 422)

the private telephone system furnishes a direct long distance connection with the Hydro Electric offices in Toronto, 80 miles away. The workmen's houses, neatly kept and fireproof, are of the cottage type. Each has its own back yard garden in which the men are encouraged to spend their leisure hours.

The commission is meanwhile working on a $2,000,000 emergency development entailing the construction of a temporary wood-stave pipe line to the Ontario Power Company's plant. This will give an additional 50,000 horse-power with which to aid in tiding the Niagora zone over the period of power famine, until the Queenston-Chippewa plant is ready for business.

The Electric Gas Meter

(Continued from page 416)

standard volume, and satisfaction was never completely attained.

It is a good deal of a nuisance to measure the actual flow in cubic feet, the pressure of the flowing gas, and its temperature. It is a good deal more of a nuisance to apply the corrections, by table and computation, for standard conditions.

These corrections are tedious; when not neglected altogether they are often poorly made, resulting in appreciable error. In any event they take so much time that the results are not useful for immediate operating purposes. Finally, when temperature and pressure vary rapidly between wide limits, the whole question of how much gas is passing through the line is thrown into confusion.

Nowadays we do not like to have such a state of affairs as this. In particular we often perform delicate work with gas power or upon gases, work which requires that the flow be regulated to a nicety at all times. If, when temperature or pressure changes, it is going to take us an appreciable time to discover the fact and a further appreciable time to change the flow of gas to meet the changed conditions, precise work is going to be out of the question. Accordingly it is in order to devise a gas meter which shall measure in terms of mass rather than of volume.

Prof. Carl E. Thomas, formerly of the University of Wisconsin and now of Johns Hopkins, has apparently attacked this problem with success. He argued that it was not necessary to measure the mass; it would be quite sufficient to measure some function of the mass. And in casting about for such a function, for some property of the gas which depends upon its mass and its mass alone, life-long interest in that particular branch of the physics of gases directed his attention to the specific heat. Here we have indeed a function of mass and not of volume.

The modus operandi contemplates that all the gas passing through the meter shall be raised precisely two degrees Fahrenheit by an electric heater, and that the amount of current necessary to accomplish this result shall be measured. Here we have obviously attained independence of all varying conditions. If the gas flows faster or becomes denser by reason of rising pressure or falling temperature we simply have to use more current; and the current that we use measures accurately the gas that passes. Changing temperatures do not throw our results out of gear, because within sensible limits it takes the same amount of heat to raise the temperature of a given mass of gas from 40 to 42 degrees as from 240 to 242 degrees—and it takes the same amount of current to create that heat.

Little comment is necessary upon the structural details of the meter. As our cut shows, and as is obvious from the very idea of the thing, a thermostatic control is the essential feature. Whenever the exit thermometer attempts to register a temperature for the departing gas which exceeds that shown by the entrance thermometer by more or less than two degrees, this control gets in its work and the balance is restored. The thermometers are resistance affairs, consisting of a long continuous section of nickel wire, whose ohmage increases with an increasing temperature. The heating coils are distributed across the passage through which the gas travels, so that they warm the whole stream uniformly.

To summarize the sequence of operation—if the mass flow of gas increases, the temperature rise in transit through the meter will become less than the predetermined two degrees. The resistance difference between the two thermometers

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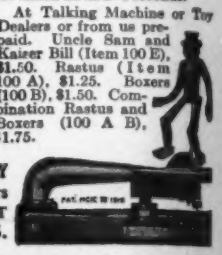

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then decreases; and the galvanometer needle, connecting them in a Wheatstone bridge circuit, is deflected. At this, the automatic regulator at once increases the heater current until the two-degree rise is again established. The oscillations of the apparatus between extremes above and below the two-degree mean are very slight, since they are corrected as soon as they begin, and get no chance to assume large proportions.

The meter dial, of course, is marked, not in kilowatt-hours as would be the case if the amount of current consumed were really the object of ultimate interest, but rather in the standard unit of gas—say cubic feet at 30 pounds and 60 degrees. Even yet, this is a manner of expressing gas masses from which it does not seem advisable to get away. Of course a few simple observations afford the basis for such calibration. The readings are then independent of any changes in gas pressure, barometer or temperature.

A very convenient annex is the graphic chart. The ordinary meter gives simply a cumulative record of the amount used to date. It is often desirable, however, to know how the rate of consumption varies from hour to hour through the day. By connecting the dial with a recording drum and needle it is made to trace a graph which gives this information completely and immediately. This of course, is a great aid in detecting irregular operating conditions, and in maintaining the plant at the proper rate of efficiency.

This meter is designed to operate on 110 or 220 volts direct current, or on single phase alternating current. Neither operation nor accuracy are affected by the voltage variations that occur in any ordinary private plant or central power-station system. When alternating current supply is used a small amount of direct current is furnished for the control circuits by a small generator on the recording panel, driven by motor. One great convenience is the possibility of having the measuring units of the apparatus located at any convenient point along the line, while the recording instruments may still be housed at the works, under constant supervision. The entire operation of the meter is controlled from the switches of the recording panel.

The Current Supplement

WHAT is Life? This is a mysterious problem that has interested many scientists for years; and although announcements have been made from time to time that living matter has been reproduced, nothing of the kind, in the popular acceptance of the term, has been accomplished. A problem leading in this direction is the investigation of what constitutes the differences of species, and this is discussed in an unusually interesting manner in an article in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2238, for November 23d, entitled, *The Bio-Chemical Characteristics of Species. Reinforced Concrete Trestles* describes and illustrates a happy application of this method of construction to railway needs as a result of the necessity for the conservation of steel. *Fixing Photographic Prints without Hypo* tells of some experiments that will be of interest to all classes of photographers. *Wheat from the Field to the Table* is a story that appeals to all of us, told by pictures. *Explosive, Expansive and Penetrating Bullets* tells of some of the methods adopted by both Germany and Austria to increase the horrors of war in disregard to all humanity. It is illustrated by a number of special drawings. The description of *The Zeppelin Biplane* is concluded in this issue. A short note on *The Roadrunner* describes and illustrates one of the queerest birds found on this continent. Other articles of special interest in this issue are *Big American Guns in France; The Choice of a Lens; Extraction of Potash from Kelp: The Eulachon*, a little known food fish; and *The Treatment of Malaria.*

Largest Automatic Phone Exchange

THE largest automatic telephone exchange in Europe was opened at Leeds last May by the British post office office department. The exchange is equiped for 6,800 subscribers, and will ultimately have a capacity of 15,000. All switches are worked by a storage battery at the exchange. No fewer than 26,000 wires enter the building. The British post office has now installed automatic exchanges at a number of towns. The manual instruments displaced by the new device are utilized in war service at the front.

Sure Cures for Influenza

THE present epidemic has given rise to the publication of numerous "sure cures" and methods more or less plausible to the lay mind. The advocates of some of these have addressed long communications to Secretary McAdoo, to Surgeon General Blue, to the War Department or other Government agencies, hundreds of them have written to editors of newspapers.

First comes the individual who has a specific remedy, the formula of which he is ready to give to the world for a price. One such writer reminds the Surgeon General of the million dollars that Congress has appropriated for combating influenza, and offers to sell his secret for "a reasonable sum."

Next comes the person with the pseudo-scientific treatment, sometimes "isotonic sea-water," sometimes "ozono therapy," and again "harmonic vibrations." One such writer well known to the New York health authorities addressed the Surgeon General from his present residence, the state hospital for the insane.

Still another type is the individual who gives freely of his advice so that humanity may be spared from the pestilence. Such a one writes, "sprinkle a little sulfur in each shoe every morning"; this was given to the people of Atlanta by a doctor of forty odd years of practice. He also used it when waiting on yellow fever years ago. Another advises people to add "ten cents worth of asafoetida to half a pint of brandy, and give a teaspoonful every two or three hours. I gave my baby ¼ teaspoonful with good results."

One writer who says he lives "at the jumping off place in western California," has perfected a patent medicine which will "knock out germs and remove the real cause of sickness. I got it by combining wonderful essential oils that will penetrate the hardest wood that grows, the compound while it is not a poison, it will penetrate any and all kinds of germs or insects and dry or burn it up in a minute." This wonderful remedy XXXXXX (name deleted by censor), sells for $1.00 per bottle.

A physician writing from Missouri offers "to furnish his remedy for the nominal price of $4.50 for each patient, or will take a Surgeon Major's commission and pay," and give his services to the Army Medical Department. He has tested his remedy "on the most desperate cases."

A patriot advises the use of a patent medicine made in Detroit. Used in a case recently, it was observed "that within thirty minutes after applying the medicine the patient was relieved of all pain in the lungs and immediately was well and about."

Comes also the mental scientist who regards the epidemic as engendered by fear. "This sort of infectious suggestion is a crime against the public, is treason to our Government, and the traitors responsible for it shall not be allowed to go unpunished."

Recalling the statement that the epidemic had probably originated in the Orient, one writer advises an examination of all pepper and tobacco throughout the country. She neglects to say what to look for in such examinations.

The food faddist is not missing from those who have sure cures. One advises the elimination of white bread, rice, coffee and tea, and the use of spring water and molasses in place of sugar.

The prescription for alcohol and chloroform to be inhaled from cotton comes from several sources, with slight variations. This is true also of the receipt for hot lemonade without sugar.

The wearing of amulets is also advocated. One writer prefers asafetida tied in a piece of gauze and worn by a string around the neck. Another recommends camphor used in the same way; still another uses a secret compound which he desires to patent. For a receipt consisting of water, salt and coal oil, and called "a sure cure for influenza," a woman writing from Missouri, states that she will be thankful for the reward which she understands has been offered by Government.

The U. S. Public Health Service urges the public to remember that there is as yet no specific cure for influenza, and that many of the alleged "cures" and remedies now being recommended by neighbors, nostrum vendors and others do more harm than good. The chief reliance must be on fresh air, nutritious food, plenty of water, cheerful surroundings and good nursing. If any specific like a vaccine or serum is found to have value, the Public Health Service will give the matter wide publicity.

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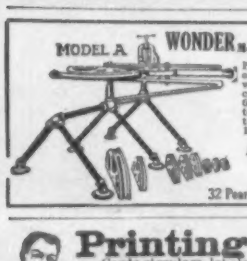

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The Ash Reveals the Coal

As a safeguard against excessive clinker troubles, specifications for the purchase of coal can be drawn to include the "softening" or "fusing" temperature of the ash. The value of such information has been recognized by the Bureau of Mines and has induced the bureau to investigate laboratory methods of determining the fusibility of coal ash, and the bearing of the results on clinker formation in fuel beds. The Bureau realized that the fusibility of a mixture of oxides and silicates such as is comprised in coal ash varies according to the conditions under which tests are made, and that in the absence of any generally accepted method, no agreement is to be expected among tests made in different laboratories. Indeed L. S. Marks has recently called attention to differences as great as 390 degrees C. that were obtained with the same sample of ash by two different laboratories. Therefore, if a fusion temperature clause is to have any place in specifications for coal, a standard method of testing should be adopted in order to insure comparable results by different laboratories and to obtain the softening or fusing temperature of the ash under conditions similar to those of a fuel bed. After a consistent method has been devised for obtaining comparable results at different laboratories, there will remain the correlation of these results with those from the burning of coal in furnaces before the value of fusibility tests in coal specifications can finally be determined.

After studying the effect of various oxidizing, reducing and neutral atmospheres, such as are found in various parts of the fuel bed, on the softening temperature of ash when molded in the form of Seger cones, the Bureau of Mines has developed a practical method of determining fusibility whereby the ash is caused to soften and form slags in which the iron exists in approximately the same state of oxidation as the iron in fuel-bed clinkers.

Although it is believed that this method will indicate the probable clinkering characteristics of a coal better than any fusion tests heretofore described, the Bureau does not recommend the general use of this method in coal specifications until it is justified by actual trial in furnace tests of different coals. As no fusibility test of a well-mixed sample of the average ash of a coal takes into account the physical distribution of the impurities in the coal as burned, much additional investigation is needed to establish the exact relation of these laboratory fusibility tests to clinker formation. In order to correlate this proposed test of minimum softening temperature with clinker formation, the Bureau is now making clinkering tests in a specially designed experimental furnace, in which different coals having ashes that differ in fusibility are burned under similar and known conditions of combustion. The results of this investigation will be published in a subsequent report. In the meantime it is hoped that other investigators will obtain similar correlation data.

Copies of the present bulletin (No. 129 of the Bureau of Mines), may be obtained free of charge by addressing the Director of the Bureau.

New Method for Transfusion of Blood

DR. FOLLEY, of Paris, has lately devised an apparatus for transfusion of blood which is claimed to mark a great advance in this direction and at the same time is of simple construction and easy to operate. A glass tube provided with a piston makes up a syringe of large output and it is operated from a distance by a piston pump connected to the syringe by a five-foot rubber tube. In this way the pump can be operated by the foot, and the same person carries out the whole operation. After fitting on the syringe a fine nickel or platinum end or hollow needle connected by a flexible silver tube, the syringe is worked in order to draw out of a healthy person a quantity of blood varying from 250 to 500 cc. The needle end is then applied to the patient and the syringe operated so as to inject the blood into his veins. One difficulty was to avoid the coagulation of the blood on contact with the glass, but this is avoided by coating the glass with a mixture containing paraffin. In this way the blood is injected into the veins of the patient in an absolutely fresh state. Operation becomes a very easy matter with this apparatus and transfusion may now be employed with much less trouble and can have a wider scope than formerly.

After-the-War Problems of Central Europe

THERE has recently been issued the second edition of a book entitled *Das Mitteleuropaishe Wirtschaftsproblem*, by Gustav Stolper, co-editor of the *Oster-reichischer Volkswirt*. The book consists of a series of articles of a scientific nature published in this journal. Stolper maintains that pre-war statistics prove nothing now and that old commercial and political formulas are no longer valid.

Gustav Stolper is a well-known writer on the economic problems of the Central Powers. In his present work he examines and describes the effects of the war, particularly with reference to the "Mitteleuropa" problems. Austrian ideas are placed in the foreground, but the author does not fail to give due attention also to German ideas.

Stolper says that the war will leave behind it a debt that will cause taxation to be trebled. Raw materials have been consumed in the central countries to the point where the supplies are entirely exhausted and new supplies of raw materials must be found. Austria will inevitably have to contract heavy debts in other countries in order to obtain these stocks of raw materials. The increased taxation will lead to higher prices and these in turn will tend to exclude Austria from the world markets where raw materials may be purchased only by paying in the form of manufactured articles.

It is obvious, of course, that Stolper wrote this book while the Central Powers were still a solid block of warring nations. With the detachment of Turkey, Bulgaria and Austria, this author may have to revise his works considerably in order to have his theories practicable.

The Paper Yarn Industry of Germany

THE use of paper yarn has been largely extended in Germany during the past half year. The importance of the industry may be judged by the increased production now amounting to about 88,000,000 pounds a year. Throughout the spring and partly also in the summer the employment of the spinning mills was not wholly satisfactory, but the conditions have since been improved. Army orders have increased in volume, and further large orders are expected. Civilian demand for yarn of all numbers has increased largely since the fees for the release of the wares have been reduced. The opposition of the public to manufactures of paper yarn which has been quite noticeable of late has been due chiefly to the exaggerated statements concerning the possibilities of paper yarns and its range of utility which have given rise to unwarranted hopes.

The manufacturing processes are constantly being improved, continues the *Frankfurter Zeitung*, and as the matters stand now, paper yarn can be used successfully in the manufacture of various fabrics and garments, excepting only body linen and the better sorts of outside garments. Workingmen's clothes, bed and table linen, curtains, sail cloth, imitation leather, and many other articles of good quality can now be made. With proper handling these products will give satisfactory results. As the genuine articles are at present scarce, the public is largely compelled to make use of these paper wares and will get along with them the better, as considerable success has been achieved in making them both usable and durable.

In many fabrics the paper yarn is combined with wool, shoddy, cotton waste, etc., and the supply of fabrics for the clothing industry is thus enlarged. It is not to be supposed that all these articles will disappear immediately upon the return of peace. The demand for them will continue undiminished for some time, and some of them may retain their place in the market permanently.

The weaving mills are now likewise more active. Army orders, as well as civilian purchases, have been more frequent, and the auxiliary industries, including paper cutting and the fitting of paper fabrics, are better employed.

The use of paper yarn for sewing thread is also increasing, owing chiefly to the scarcity of cotton and linen thread. The preparation, twisting, etc., have been improved to such an extent that the paper threads are strong and durable enough to be used in the manufacture of coarse clothing and sacks. The German army administration has placed large orders for paper sewing thread. Thread of the very fine numbers can not as yet be manufactured of paper yarn.

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NEW BOOKS, ETC.

NAVIGATION. Illustrated by Diagrams. By Alfred Goldsborough Mayor. Philadelphia and London: J. B. Lippincott Company, 1918. 16mo.; 207 pp. Price, $1.50 net.

This excellent little handbook is addressed to men of limited mathematical training, and gradually and easily leads up to Sumner lines and St. Hilaire's method; all important methods are explained and the instructions, augmented by numerous diagrams, are thorough and complete. The author is an instructor in navigation at Princeton University and, as before indicated, his descriptions are so simplified as to make ordinary arithmetic sufficient to a mastery of the text. His intimate acquaintance with the needs of the student is amply evinced by the way in which these needs are met.

MODERN NAVIGATION. By Frank Seymour Hastings. New York and London: D. Appleton and Company, 1918. 16 mo.; 95 pp.; illustrated. Price, 75 cents.

Mr. Hastings "Modern Navigation" supplements his "Navigation—A Short Course," in which time-sights, the prevailing method in the merchant marine, was concisely presented; in this later work he goes into the more complicated Sumner-St. Hilaire practice generally followed in the Navy. Those desirous of qualifying as ensigns in the Navy, or as officers in the Naval Reserve or merchant marine, will find these expositions clear, comprehensive, and extremely helpful in the present national emergency.

SIR WILLIAM RAMSAY. As a Scientist and Man. By Tarini Charan Chaudhuri, M.A. Calcutta: Butterworth and Co., 1918. 12mo.; 76 pp.; illustrated. Price, Rs. 1/8/ net.

Prof. Chaudhuri's brief but sympathetic delineation shows the great chemist to have been a man of even temper and unaffected simplicity. The monograph goes on to describe his activities and discoveries, particularly those brilliant achievements in the radio-active field that point to the electrical origin of matter and the transmutation of elements by disintegration. Prof. Neogi, of the Government College at Rajshahi supplies an introduction, and an appendix contains a list of Sir William Ramsay's papers, a feature of considerable value to the student.

NOTES FROM THE FRONT. Vol. 1. By Major C. R. Yates, British Army. Menasha, Wis.: George Banta Publishing Co., 1918. 16mo.; 128 pp.; illustrated.

This little volume concentrates within pocket compass the most valuable pointers on trench warfare and field defenses, and our own officers will find their duties and responsibilities at the front carefully outlined. There are field notes on the Belgian, French and German armies, and concise details of procedure in billeting, on entrance into captured towns, and in many other of the circumstances and exigencies of existing methods of warfare. It is an excellent summary for the busy man.

CIVIC BIOLOGY. By Clifton F. Hodge, Ph.D., and Jean Dawson, Ph.D. New York and Boston: Ginn and Company, 1918. 8vo.; 381 pp.; illustrated. Price, $1.60.

"Civic Biology" is a new high school text showing what our civic problems are, and how they may be solved by cooperative good will. The student is taught that insects and rats, disease and famine, are linked together in a chain of cause and effect unnoticed by the unaided eye, yet binding and slaying its millions while war is undoing its scores; and that only by an intelligent knowledge of these subtle relationships can we institute measures that will make the common life safer and happier and conserve natural resources. The work, whether it deals with birds or trees or agriculture or bacteria, demonstrates its authors' ability to keep the youthful mind on the alert and to put into it ideas and ideals of service that must beneficially affect human life in days to come.

TNT AND OTHER NITROTOLUENES. By G. Carlton Smith, B.S. New York: D. Van Nostrand Company, 1918. 8vo.; 140 pp. Price, $2 net.

It is natural that triple nitrated toluene, the most efficient explosive of warfare, should be the subject of much interested investigation; this research has extended from the chemistry of its compounds to the finer details of manufacture. The writer sketches the history of the discovery of toluene and the development of its nitrocompounds; the manufacture, purification, inspecting and testing of TNT, and its physical and chemical properties, are very fully described; a chapter is devoted to the mono- and dinitrotoluenes, and there is some discussion of the accidents and diseases occurring in TNT plants.

THE THEORY OF ENVIRONMENT. Part I. By Armin Hajman Koller, Ph.D., Menasha, Wis.: George Banta Publishing Company, 1918. 12mo.; 104 pp. Price, $1.

The author traces mesologic thinking back to the Jewish prophets and follows its progress through Plato, Bodin, and Montesquieu to the more modern conceptions of environmental influence. Huntington's stimulating investigation, "Civilization and Climate," is summarized in an appendix. Little of the bibliography of the subject has been overlooked, and students will look forward with eagerness to the projected second part of the work, in which the history of the theory as it has been applied in various sciences and in literature will be continued.

REGIMENTAL NICKNAMES AND TRADITIONS OF THE BRITISH ARMY. London: Gale and Polden, Ltd. 8vo.; 131 pp.; illustrated. Price, 2s. net.

Every regiment of the British army has its distinctive uniform, colors, and traditions, to say nothing of the inevitable nickname, which often embodies an interesting story. This attractive work, profusely and brilliantly illustrated, summarizes the glorious history of the Cherubims, the Galloping Gunners, the Death or Glory Boys, the Saucy Sixth, and all the rest of those ready units who have made history under many skies.

WENDELL'S LIST OF SHIPBUILDERS AND AEROPLANE MANUFACTURERS. New York: H. F. Wendel, 1918. Price, $15.

WENDEL'S LIST OF EXPORT COMMISSION HOUSES AND FOREIGN BUYERS. New York: H. F. Wendel, 1918. Price, $18.

The first of these pamphlets in loose-leaf binding lists the shipbuilders of the United States and Canada, names their purchasing agents, and indicates the tonnage building and contracted for and the materials of construction; this information is arranged by States. This edition, the second, contains ten supplementary pages that add many more names and make corrections to date. Besides aeroplane manufacturers it lists naval architects, ship chandlers, and wrecking and dredging companies. The compilation has been used to good advantage by the Emergency Fleet Corporation and should prove useful to buyers and sellers the country over. Another list from the same source gives 2,200 export commission houses, buyers now acting in this country for foreign houses, and United States buying offices of supplies for foreign countries, indicating the lines of merchandise handled, and including a supplement of new names. Both these directories represent a sterling service that will doubtless find ready appreciation.

SIMPLE RULES AND PROBLEMS IN NAVIGATION. By Charles H. Cugle, Licensed Master Mariner. New Orleans, La.; Palfrey-Rodd-Pursell Co., Ltd., 1918. 8vo.; 260 pp.; with charts. Price, $3.50 net.

Rule-of-thumb methods have lost many a ship. It is time enough, the author urges, to use short cuts after years of experience in orthodox calculations, and saving of time is not an object at sea. So the every-day problems in navigation are here worked out in detail, making it easy for the young officer to understand the why and wherefore, and the result is a timely work, unburdened by theory, that the student will heartily appreciate. Useful definitions and information introduce the rules and problems, and practical instruction in plotting is furthered by the means of folding charts.

GEORGE WESTINGHOUSE. His Life and Achievements. By Francis E. Leupp. Boston: Little, Brown, and Company, 1918. 8vo.; 316 pp.; illustrated. Price, $3 net.

With no little difficulty, for George Westinghouse was not a diary-maker or note-taker, the biographer has collected from widely-scattered sources enough incidents and facts to place before us in considerable detail the life of this typical American inventor. To most people, the word "Westinghouse" immediately conjures up the words "air brake," and that is all. But his contributions to railroad equipment began with a device for expeditiously replacing cars on the track, followed soon afterwards by an improved frog. His automatic railroad signal ranks in importance with the air brake, and his application of the alternating current made possible the transmission of electric power over long distances. This is the first time his story has been adequately told, and it shows the superiority of courage over capital and of persistence over "pull."

KNIGHTS OF THE AIR. By Lieut. Bennett A. Molter, Pilote-Aviateur, Armée Francaise. New York and London: D. Appleton and Company, 1914. 8vo.; 244 pp.; illustrated. Price, $1.50 net.

The knight of the air who writes this unassuming but absorbing account is an American who volunteered for the service in 1916, and his experience well qualifies him to tell of "the ways and means of turning an average young fellow into some sort of aviator," and to narrate the thrilling deeds that come under his direct observation. What distinguishes the flying man from his fighting brethren is the right to remain an individual. Alone he fights, alone he conquers, alone he dies. Without becoming in the least degree technical Lieutenant Molter manages to convey much information as to methods in air fighting, and there are eight illustrations of French and German machines—the Gotha, the Morane Parasol, the Cauldron, the Rumpler. A final chapter, "America in the Air," deals with the citations and honors our own men have won, with thumbnail sketches of the more prominent performers.

HANDBOOK OF TRAVEL. Prepared by the Harvard Travellers Club. Cambridge: Harvard University Press, 1917. 12mo.; 544 pp.; illustrated. Price, $2.50.

This is not a guide for the casual tourist but is addressed to the pioneer of the wild and the scientific explorer. Only a vast equipment of practical knowledge can assure the success of such expeditions, and here, in a single volume, that knowledge is imparted by past masters. If the pleasure tripper can be induced to augment the interest of his journeys by learning to observe and gather facts and objects of value, then he too may find guidance in the papers of this work. These deal with their material under the broad headings of camp and camp equipment, methods of transport, mapping and route surveying, and records and observations of travel.

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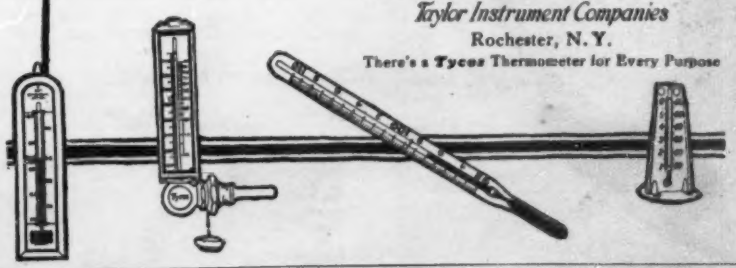

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Old Point Comfort is most easy to reach. Fare is but a small fraction of that to far Southern resorts.

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View of Hotel Chamberlin, Old Point Comfort Taken from a Caproni Triplane

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INDIVIDUAL INSTRUCTION IN RIFLE PRACTICE. With a Chapter on Revolver Shooting. By Lt.-Col. A. J. Macnab, Jr., U. S. A. Cincinnati: Stewart & Kidd Company, 1918. 16mo. 105 pp.; illustrated. Price, 75 cents; net.

THE SQUAD LEADER'S NOTE BOOK. 1918. Menasha, Wis.: George Banta Publishing Company.

The instruction in rifle practice follows the system first used with striking success by the Second Battalion, U. S. Infantry; in three target seasons every man in the post had qualified as marksman or better. Lt.-Col. Macnab's presentation of this system has been endorsed by Government officials and is widely used throughout the Army. Any one who aims at proficiency with the rifle or revolver will find their shooting benefitted by a knowledge of the methods so well expounded in this handbook. The Squad Leader's Note Book binds together report blanks and formations blanks. Drill commands and the correct way of executing them are given, squad and company evolutions and guard mounting are explained, and definitions of military terms conclude the handy little work.

PREPARING FOR WOMANHOOD. By Edith B. Lowry, M.D. Chicago: Forbes and Company, 1918. 12mo.; 175 pp. Price, $1 net.

Dr. Lowry's latest volume in her sex hygiene series answers the questions that naturally arise in the minds of girls between the ages of fifteen and twenty-one. Their lives are regarded as hope chests to be filled with wholesome knowledge that shall enable them to avoid the sad results of ignorance, to give health, recreation and personal appearance their proper value, and to make themselves efficient in business, the home, and motherhood.

CEDAR CHESTS. How to Make Them. By Ralph F. Windoes. Milwaukee: The Bruce Publishing Company, 1918. 8vo.; 72 pp.; illustrated.

In view of the increasing popularity and use of the cedar chest, this comprehensive monograph by the Instructor of Manual Training in the High School of Davenport, Iowa, should be welcomed by all amateur cabinet makers. Mechanical considerations are preceded by a chapter on the wood, its sources, variations and uses. From the building of a simple chest the student is carried on to the design and construction of massive and richly ornamental pieces of furniture. Methods of construction are shown by well-drawn diagrams, and there are photographic reproductions of ancient chests from the collections of the Metropolitan Museum of Art.

ARITHMETIC MADE EASY. By Marvin Dana, M.A., LL.B. New York: Edward J. Clode, 1918. 12mo.; 146 pp.; Price, $1 net.

The writer believes that the child's antagonism to the study of arithmetic is due rather to an injudicious method of teaching than to any inherent difficulties in arithmetic itself. He has to study a new language before he can get down to simple principles and is thus discouraged at the outset. "Arithmetic Made Easy" dispenses with the memorization of hard rules and makes the study interesting by presenting its elements in short words and brief paragraphs that contain nothing but readily-grasped statements. The text is a step in the right direction and should receive the attention it deserves.

THE HISTORY OF STATISTICS. Their Development and Progress in Many Countries. Collected and edited by John Koren. New York: The Macmillan Company, 1918. 8vo.; 785 pp. Price, $7.50.

It is impossible for a nation to go far along the road to a wise conservation of its resources and an efficient direction of its forces until it has collected a dependable body of information in the form of statistics. The intelligent formulation of laws and the equitable exchange of values are coming more and more to depend upon the diligent research of stable organizations, and the putting of the results of that research into tables that compare related facts and crystallize growth and trend into easily understood figures. It was a happy idea of the American Statistical Association to celebrate its seventy-fifth anniversary by giving to the world a history of the development of official statistics throughout the world. In its pages speak the men who have been most intimately connected with this gathering, arrangement and dissemination of vital facts.

EXPORTERS' ENCYCLOPAEDIA. Fourteenth (1918-19) Edition. New York: Exporters' Encyclopaedia Company. 8vo.; 1347 pp.; with maps. Price, $8.50.

The shipper who must keep in touch with matters relating to export trade finds his problems solved by this very complete guide and the monthly corrections that are included in its service. Its use will enable the shipper to avoid delays, fines, and dissatisfied customers, and will place at his hand all practical routes to every place on the map, with information as to whether a through bill of lading is procurable and, if not, the nearest port in which it can be obtained; if there are consular regulations to be observed, their nature and exact cost are given, and the requirements of transportation companies as to bills of lading and payment of freight are indicated. By looking up, through the index, the country to which shipment is to be made, he finds all necessary information covering the shipment. The inexperienced exporter may thus place himself on an equality with his fellow-shippers, and both experienced and inexperienced may derive marked advantages from the use of the Encyclopaedia.

AS A MAN LIVETH. Cleveland, Ohio: Associated Metal Lath Manufacturers, 1918. 4to.; 31 pp.; illustrated. Price, $1.

A well-selected collection of pictures makes this a pleasing gallery of architectural design, with the specific aim of showing the adaptability and beauty of stucco on metal lath construction. Our largest industrial enterprises have found it advisable, and "good business," to erect good homes for their workers, and this class of houses receives the largest representation in the illustrations. Stucco on metal lath also offers material inducements in the way of economy and fire-resisting qualities; its many advantages are graphically exhibited in "As a Man Liveth."

THE AMERICAN POSTAL SERVICE. By Louis Melius. Washington, D. C.: Louis Melius, 1917. 8vo.; 112 pp.; illustrated.

Without any claim to comprehensiveness, this monograph fills a niche of its own and provides reference material that will enable post office employees and other interested persons to satisfy themselves and to answer inquirers as to general postal history, kinds and costs of service, and receipts and expenditures. It describes the American system in aim and operation and provides a fund of miscellaneous information covering activities to a recent date.

ELEMENTARY NAVAL ORDNANCE AND GUNNERY. By Lieutenant H. C. Ramsey, U. S. A. Boston: Litt'e, Brown, and Company, 1918. 12mo.; 410 pp.; illustrated. Price, $3 net.

A good teacher learns much from the questions of his students; Lieut. Ramsey acknowledges his indebtedness to the Cadets of the Ensign School at Harvard, and in this course designed for young officers he utilizes his knowledge of the difficulties of the average student to such effect that these are so well met that a good grounding in naval gunnery is imparted with the least possible waste of time. His very thorough papers deal with the guns, their types, manufacture, mounts, and breech mechanisms; with fire control and spotting; and with the care and preservation of the guns. There are also chapters on torpedoes, automatic rifles, battle drills, and close-order infantry. It is a splendid book for the busy man.

TETON SIOUX MUSIC. By Frances Densmore. Washington: Government Printing Office, 1918. 8vo.; 589 pp.; illustrated.

In this absorbing examination of the songs of the Sioux, the author strengthens the reputation she made in her analytical study of Chippewa music. In this volume, the songs are classified according to age, and the influence of civilization upon the structure of the later melodies is strikingly shown. Since "all old music is associated with things that lie very close to the heart of the Indian," this collection with its interpretations will appeal not only to students of music but to all ethnological investigators also.

MEN OF THE OLD STONE AGE. Their Environment, Life and Art. By Henry Fairfield Osborn, Sc.D., LL.D., etc. New York: Charles Scribner's Sons, 1918. 8vo.; 587 pp.; illustrated. Price, $3.50 net.

We took occasion to commend this scholarly yet universally interesting work on its first appearance in 1915. The third edition adds an account of the Palaeolithic history of Spain and the western region of northern Africa. The author personally examined the principal cavern regions of southwestern Europe under the guidance of those distinguished archaeologists, Cartailhac, Breuil, and Obermaier, and illustrations made by skilful artists reincarnate for us the men and ape-men of obscure ages. The clear thinking of the author stamps every page with its own originality, while the best art of the printer and binder has been evoked toward giving this thought an artistic and dignified setting.

ELEMENTS OF GENERAL SCIENCE. By Otis William Caldwell, Ph.D., and William Lewis Eikenberry. New York: Ginn and Company, 1918. 8vo.; 410 pp.; illustrated.

That there is a science of science teaching is happily coming to be recognized. In this second edition of a widely-accepted first-year high school course, the authors have availed themselves of ten years of experiment in this direction, and of the efforts of many teachers who advocate the methods of experimental science in school courses. Unity has been maintained by logical interrelations of the various topics, and the result is a text of unusual interest and excellence.

ANNUAL CHEMICAL DIRECTORY OF THE UNITED STATES. Baltimore: Williams and Wilkins Company, 1918. 8vo.; 540 pp. Price, $5 net.

The situation in industrial chemistry lends additional importance to a knowledge of sources of supply. The second edition of this Directory will be found eminently satisfactory both in scope and arrangement. Chemicals essential for laboratory and industrial purposes are alphabetically given, with manufacturers and dealers listed alphabetically and geographically. Other sections deal with chemical and chemical engineering apparatus, machinery and mechanical supplies; analytical and consulting chemists and chemical engineers; laboratories, and technical and scientific societies both United States and foreign; and publications covering the field. Chemical nomenclature has been standardized as far as possible. It needs but a glance at the work to see that the editors have been conscientious and capable, and it should immediately take high place as a dependable and comprehensive directory of wide usefulness.

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PIERCE-ARROWS yield big dividends because they are built to endure. Designed right, built painstakingly of selected material, they can't fail. Regular inspection keeps them right, keeps earnings up and costs down.

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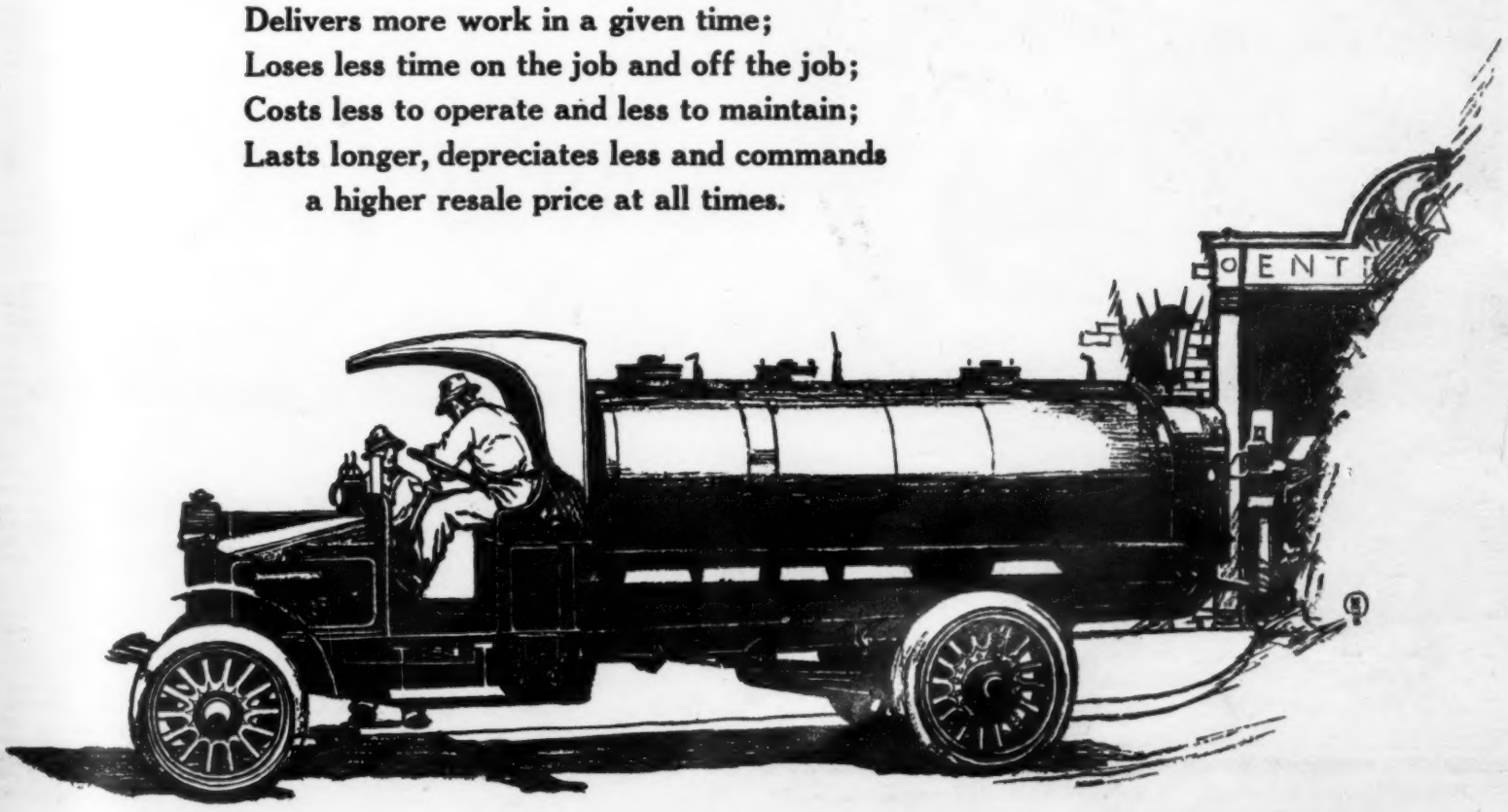

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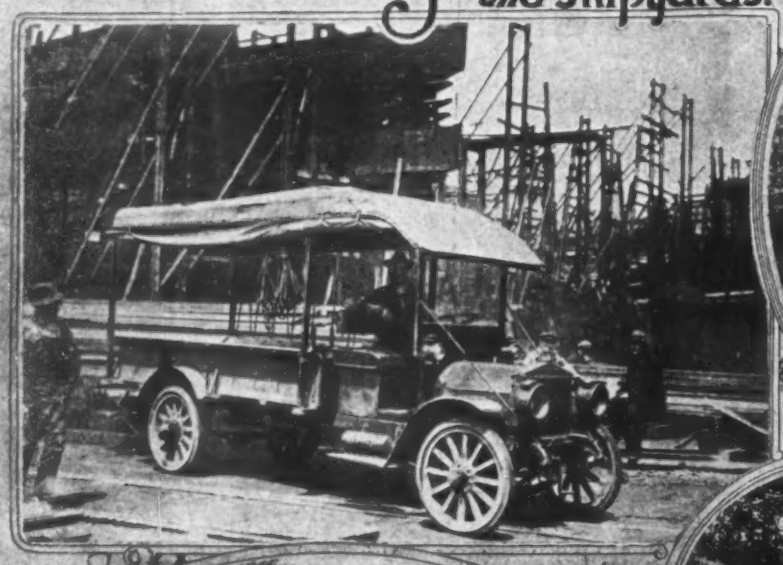
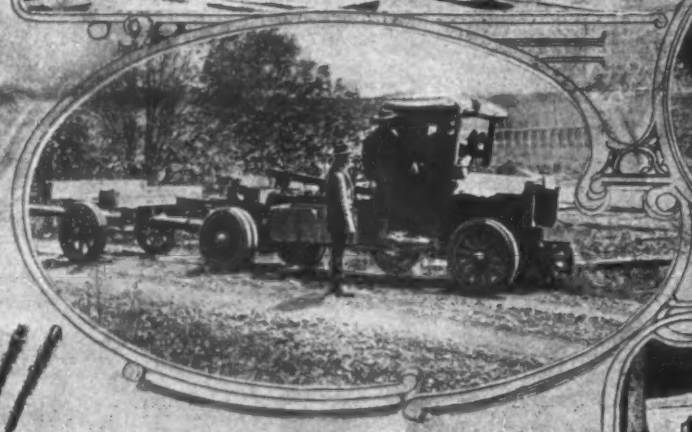
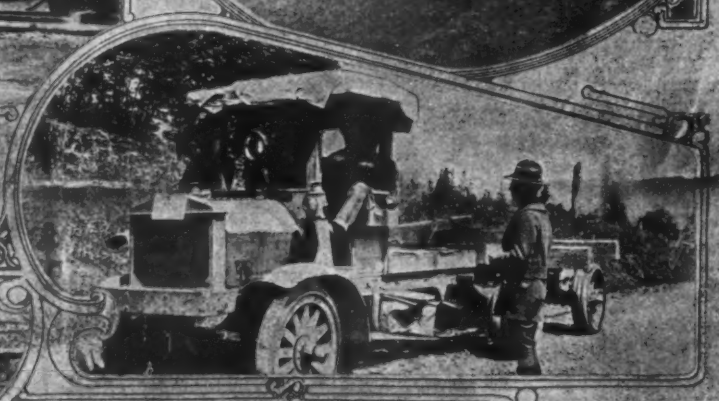
AUTOMOBILES **THE POST-INTELLIGENCER.** GOOD ROADS

SEATTLE, WASHINGTON, SUNDAY, JUNE 2, 1918.—PART SIX.

FEDERAL TRUCKS at Work for Democracy in Spruce Camps and Shipyards.







OVERLOADS AND OVERWORK SEVERE TEST FOR TRUCKS

War Service in Forest and Shipyard Put Carriers to the Acid Trial—Federals Make Record.

Down on the water front there is a call for haste. Uncle Sam needs ships.

In the timber regions of Grays harbor and Willapa harbor Uncle Sam is rushing cut spruce for airplane stock. The need is urgent and will brook no delay.

Federal trucks are doing their bit in both places. Thousands of them are in the government service in all parts of the country, but the spruce camps of Washington are probably giving the Federals their hardest tryout. The roads are just common makeshifts that are typical of logging camps. The cry of the hour is speed and more speed. Overloads and overwork are the order of the day, and trucks, like man power, are expected to be on hand from sunrise to sunset and oftimes well into the night, carrying the spruce to the railroad.

When the spruce production was put under a forced draft, the signal corps of the army, which has the spruce work in hand, investigated the performance of the various trucks then in operation in the timber regions, and the result was that a fleet of Federals was ordered for the work. The splendid record of the Federals in the woods has made them the favorite of the soldier-loggers, and the slogan, "Another Federal," is the call of the loading stations when the logs come in particularly fast.

At the Seattle Construction & Dry Dock Company another Federal is making a record for stability and speeding up the ships that are to perform their part in beating the Hun on the battle fields of Europe. The two-ton Federal works two eight-hour shifts in the shipyards, hauling heavy plates and ship fittings from the shops and unloading platforms to the sides of the ships. Overloads are the customary thing at the big plant, and it is a rare occasion when the Federal carries less than twice its capacity. For nearly a year this has been going on, only each succeeding month has seen the work heavier and the overloads greater, yet the Federal is a stranger to the shop, and the men who drive it claim that they have not lost thirty minutes because of any mechanical trouble.

That is the Federal record in Washington. Hundreds of other Federals are doing their bit in speeding up business, saving man power and reducing overhead cost in order that America may quickly and effectively reach its maximum efficiency in the world war.

YOUNG STUDENT IS INVENTOR OF GLARELESS LENS

need we add anything more to this

FEDERAL

One to Seven Ton Capacities

FEDERAL MOTOR TRUCK COMPANY, DETROIT, MICHIGAN

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When you finish reading this magazine, place a one cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers or sailors destined to proceed overseas. NO WRAPPING, NO ADDRESS.

A. S. Burleson, Postmaster General.

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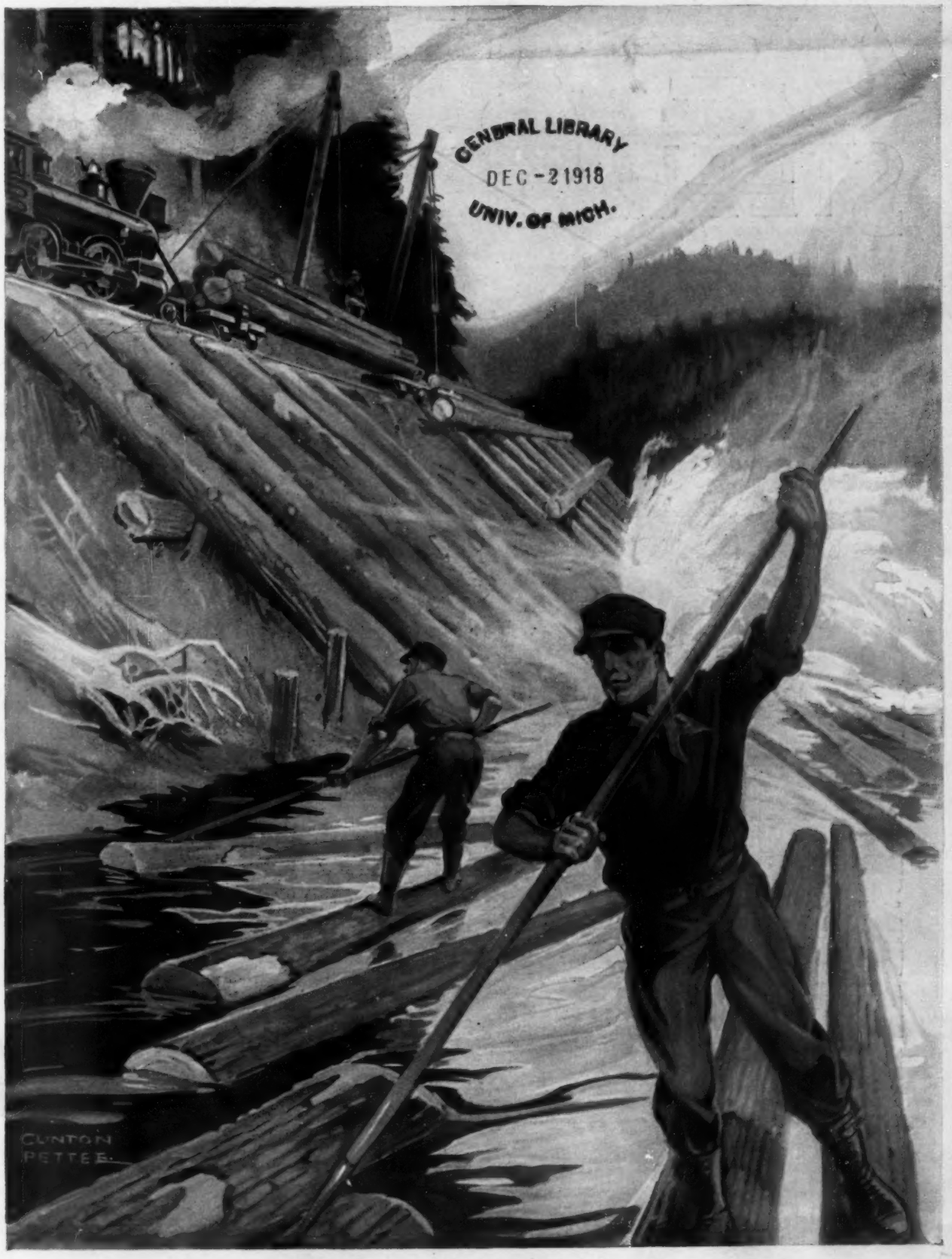
Entered as second class matter June 18, 1879, at the post office at New York, N. Y., under the Act of March 3, 1879.



MAKING UP LOG RAFTS AT A LOGGING RAILROAD "TERMINAL" [See page 438]

Vol. CXIX. No. 22
November 30, 1918

Published Weekly by
Munn & Co., Inc., New York, N. Y.

Price 10 Cents
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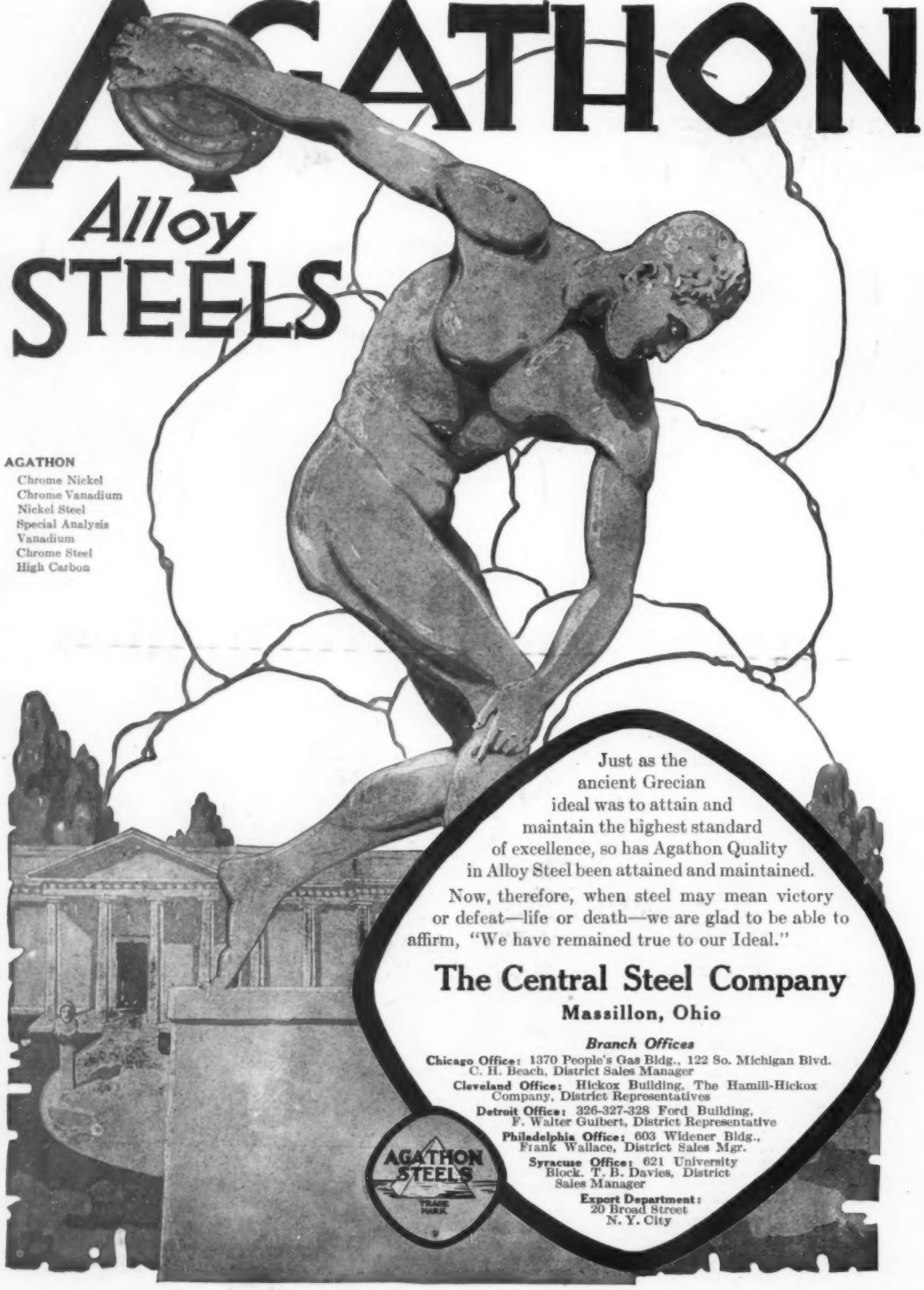

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Just as the ancient Grecian ideal was to attain and maintain the highest standard of excellence, so has Agathon Quality in Alloy Steel been attained and maintained.

Now, therefore, when steel may mean victory or defeat—life or death—we are glad to be able to affirm, "We have remained true to our Ideal."

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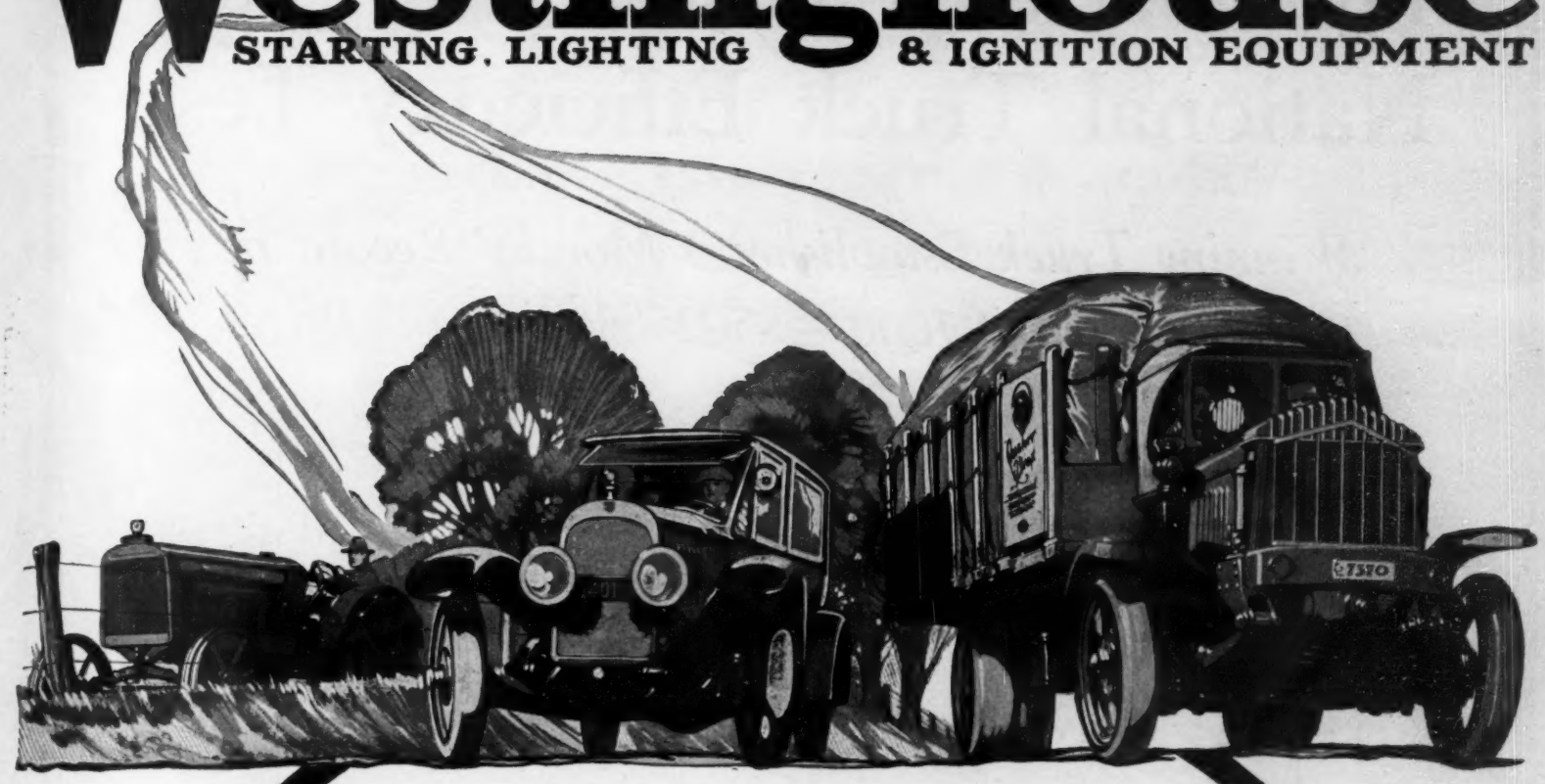

Paying for Performance

Millions of passenger cars, trucks and tractors have for months been rendering a service never before required.

Motor transport has been taking an increased importance in the movement of the Nation's freight.

Goods have been distributed, railroads relieved, congestion reduced, the public served—all by motor power.

Farm labor shortage has been offset by the labor saving ability of the farm tractor and the motor truck.

During the strenuous times through which we have been passing it has been realized more than ever that there is one thing that must be paid for, no matter whether an automotive vehicle is new or old—light or heavy. That thing is *Performance*.

In performance, quality is first; price second.

Westinghouse policy of putting into its product the quality of material and workmanship necessary for service under difficult conditions has been proved correct again and again by the contribution of Westinghouse equipment to the actual performance of cars, trucks and tractors.

Fundamental soundness of product will be as vitally important in the days of reconstruction as during the many months when the efforts of the Westinghouse Company, as of many other manufacturers, have been concentrated on the winning of the war; when munitions and electrical power machinery have necessarily come first, and apparatus even of such essential character as automobile starting and lighting equipment has had to take second place.

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WESTINGHOUSE ELECTRIC

1760 Packard Trucks Complete National Truck Efficiency Test

Winning Truck Establishes 3 Months' Record of 952 Points out of 1000—$5025 Awarded in Prizes

THE National Truck Efficiency Test was organized and conducted by the Packard Motor Car Company in co-operation with the efforts of the National Council of Defense and the War Industries Board to put motor trucking on a basis of higher efficiency, and to save railroad facilities for urgent Government uses.

The test consisted of three months' running, all phases of the truck performance and truck costs being recorded daily on the National Standard Truck Cost System, as perfected by the Truck Owners' Conference.

The trucks were divided in three classes, according to capacity.

Prizes were awarded in each class—$1000 to the owner of the winning truck; and to the drivers, $500 for *first*, $100 for *second*, and $75 for *third* best records.

The Prize Winners in the National Truck Efficiency Test

Class A—1½ and 2 ton trucks

FIRST: What Cheer Chemical Co., Pawtucket, R. I., James L. Drury, Driver.

SECOND: Edson Moore & Co., Detroit, Mich. Edward Dallas, Driver.

THIRD: Edson, Moore & Co., Detroit, Mich. L. Moore, Driver.

Class B—3 and 4 ton trucks

FIRST: H. F. Cherigo & Sons, Baltimore, Md., Lew Bacighipi, Driver.

SECOND: Salt Lake City Pressed Brick Co., Salt Lake City, Oloff Hanson, Driver.

THIRD: Harper & Wilz, Baltimore, Md., C. Wilz, Driver.

Class C—5 and 6 ton trucks

FIRST: W. M. Hoyt Co., Chicago, Ill. Joseph Brookbank, Driver.

SECOND: Gottfried Krueger Brewing Co., Newark, N. J. Charles Langbein, and Joseph Birchler, Drivers.

THIRD: H. F. Cherigo & Sons, Baltimore, Md., J. Butts, Driver.

THIS three months' test of 1760 Packard Trucks in all parts of the United States is the first *all-'round* and nation-wide test of truck hauling ever conducted.

It is the first to consider and record the *transportation factors* that enter into truck efficiency:—

Traffic Conditions	Return Load
Type of Country	Percentage of Capacity
State of Roads	Economy in Gasoline
Type of Tires	Economy in Tires
Running Time	Economy in Oil
Loading and Unloading Time	Economy in Upkeep
Outgoing Load	Wage Cost
	Condition of Truck

Many a truck owner, discovering that his fleet is costing more than it should, finds all his efforts at economy baffled—because he thinks of efficiency only as a matter of trucks.

Truck efficiency depends on *transportation principles.*

There is not a truck owner in the United States but can benefit by the results of the Packard National Truck Efficiency Test.

They are *transportation results.*

They are just as applicable to the single truck as to the fleet—to the little delivery car as to the Packard.

Whether you are a Packard Truck user or not—the Transportation Department of your local Packard Branch or Packard Dealer will be glad to see you. They will talk the thing over with you—show you what transportation results to look for and how to record them day by day on the National Standard Truck Cost System.

One of the most vital things for the Nation today is that every transportation agency shall come as near 100% efficiency as possible.

It is an extension of the Packard program of 100% War Work to give the results of this test to every truck owner or driver who will make use of it—*freely, and without thought of imposing obligation.*

PACKARD MOTOR CAR COMPANY

Detroit, Michigan